UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA

CASE NO.: 08-CIV-80893-MARRA/JOHNSON

JANE DOE,

Plaintiff,

vs.

JEFFREY EPSTEIN,

Defendant.
_______________________________/

DEFENDANT EPSTEIN'S MOTION FOR SETTLEMENT CONFERENCE, OR IN THE ALTERNATIVE, MOTION TO DIRECT PARTIES' BACK TO MEDIATION

Defendant, JEFFREY EPSTEIN, by and through his undersigned attorneys, pursuant to the Federal Rules of Civil Procedure and the Local Rules for the Southern District of Florida, moves this Court for an order requiring the parties to attend a Settlement Conference before Magistrate Judge Linnea R. Johnson, or in the alternative, for an Order directing the parties to reconvene at a second mediation on or before July 1, 2010, and as grounds set forth would state:

1. The above-styled matter is currently scheduled on the Court's trial docket beginning July 19, 2010. (D.E. #119, Order Re-Setting Trial Date and Pretrial Deadlines). The Court's Mandatory Pretrial Stipulation and Motions in Limine deadlines are set for July 1, 2010. In this regard, if the parties could reach an agreement at a settlement conference or a mediation before these pre-trial deadlines, it would result in substantial conservation of judicial resources and preparation time.

2. The parties attended mediation on April 5, 2010, at Matrix Mediation, LLC, with Rodney Romano serving as mediator, but were unable to reach an agreement. (See D.E. #139).

3. Since the April 5, 2010 mediation, additional discovery has been completed and exchanged, including each parties' psychological (Plaintiff) and psychiatric (Defendant) expert depositions. As well, Defendant filed his Motion for Summary Judgment and Motion for Bifurcation. Both parties have exchanged witness and exhibit lists. Each party will be filing extensive Motions in Limine. Plaintiff's Trial Witness List has identified over 170 potential witnesses, and further, Plaintiff identifies over 140 trial exhibits, including composite exhibits that are hundreds of pages in length. It is conceivable this case could last 12- 20 trial days.

4. Additionally, since the parties attended mediation on April 5, 2010, Defendant has resolved all pending lawsuits, including Plaintiff, C.L. (Case No.: 10-80447) and JANE DOES Nos. 2-8 (Case Nos.: 08-80119, 08-80232, 08-08380, 08-80381, 08-80994, 08-80993, 08-80802), C.M.A. (Case No.08-80811), Jane Does Nos. 101, 102 and 103 (Case Nos. 09-80591, 09-80656, 10-80309), another Jane Doe (Case No. 08-80804), Jane Doe II (Case No. 09-80469), as well as other non-filed claims. Furthermore, Defendant has also resolved three state court claims. The only cases not resolved are this case and two (2) cases in state court (all three Plaintiffs are represented by Plaintiff's counsel, Brad Edwards, Esq. and his firm). [1]

5. Plaintiffs in other filed cases were represented by various law firms as the court is aware.

6. With the additional discovery completed to date and with the motions, trial preparation and judicial rulings necessary to try this case, all yet to be done, Defendant

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[1] There is also a case styled L.M. v. Jeffrey Epstein, CASE NO.: 09-CIV-81092 – MARRA/JOHNSON, which was never served on the Defendant. Defendant has filed a Motion to Dismiss.

believes that a settlement conference or mediation is in the best interest of both parties to attempt resolution. There is no prejudice to either party.

7. Therefore, Defendant requests the Court issue an order directing the parties to attend a Settlement Conference before Magistrate Judge Johnson or that the Court direct the parties to attend a further mediation before July 1, 2010. Both Magistrate Judge Johnson and Rodney Romano (as the mediator in this case) are very familiar with the particular case and other claims that were asserted.

8. Defendant's Counsel has spoken with the secretary for the mediator, Rodney Romano, and she believes that he would be able to schedule a 2-3 hour mediation on short notice this week.

WHEREFORE, Defendant, JEFFREY EPSTEIN respectfully requests the Court to enter an Order directing the parties to attend a Settlement Conference before Magistrate Judge Linnea R. Johnson, or in the alternative, a mediation on or before July 1, 2010.

Rule 7.1 Certification

I hereby certify that counsel has communicated by telephone with Plaintiff's counsel in a good faith effort to resolve the issues set forth herein. Plaintiff's position is that the parties have already complied with the mediation requirements.

By: s/Robert D. Critton, Jr.
Robert D. Critton, Jr.
Michael J. Pike
Attorneys for Defendant Epstein

Certificate of Service

I HEREBY CERTIFY that a true copy of the foregoing was electronically filed with the Clerk of the Court using CM/ECF. I also certify that the foregoing document is being served this day on all counsel of record identified on the following service list in the manner specified via transmission of Notices of Electronic Filing generated by CM/ECF on this 28th day of June, 2010:

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Respectfully submitted,

By: /s/ Robert D. Critton, Jr.
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(*Co-Counsel for Defendant Jeffrey Epstein*)

IN THE CIRCUIT COURT OF THE
FIFTEENTH JUDICIAL CIRCUIT IN
AND FOR PALM BEACH COUNTY, FLORIDA
GENERAL JURISDICTION DIVISION

JEFFREY EPSTEIN,
Plaintiff,
vs. No. 502009CA040800XXXXMBAG
SCOTT ROTHSTEIN, individually,
and BRADLEY J. EDWARDS,
individually,
Defendants.
_______________________________/

500 East Broward Boulevard,
Ft. Lauderdale, Florida
Thursday, June 14, 2012
9:14 a.m. - 12:37 p.m.

DEPOSITION
Of
SCOTT ROTHSTEIN
(Via Video Conference)

Taken on behalf of the Trustee
pursuant to a notice of taking deposition

- - -

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IN THE CIRCUIT COURT OF THE FIFTEENTH JUDICIAL
CIRCUIT IN AND FOR PALM BEACH COUNTY, FLORIDA
CASE NO. 50 2009CA040800XXXXMB AG
Complex Litigation, Fla.R.Civ.Pro. 1201

JEFFREY EPSTEIN,
Plaintiff,
-vs- VOLUME I OF II

SCOTT ROTHSTEIN, individually,
BRADLEY J. EDWARDS,
individually, and L.M. individually,

Defendants.

VIDEOTAPED DEPOSITION OF BRADLEY J. EDWARDS, ESQUIRE

Tuesday, March 23, 20010
10:00 - 5:07 p.m.

2139 Palm Beach Lakes, Boulevard
West Palm Beach, Florida 33401

Reported By:
Cynthia Hopkins, RPR, FPR
Notary Public, State of Florida
Prose Court Reporting
Job No.: 1333

APPEARANCES:
On behalf of the Plaintiff:
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and
On behalf of the Plaintiff:
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SEARCY, DENNEY, SCAROLA,
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ALSO PRESENT:
Jeffrey Epstein
Joseph Kozak, Videographer
Prose Reporting Services

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PROCEEDINGS

- - -

Deposition taken before Cynthia Hopkins, Registered Professional Reporter and Florida Professional Reporter, and Notary Public in and for the State of Florida at Large, in the above cause.

- - -

THE VIDEOGRAPHER: We are now on video record. This is Media Number One in the videotaped deposition of Bradley Edwards in the matter of Jeffrey Epstein versus Scott Rothstein, Bradley J. Edwards, and L.M.
Today is Tuesday, March 23rd, 2010 at 10:00 a.m. We're here in the law offices of Searcy, Denney, Scarola, Barnhart & Shipley, 2139 Palm Beach Lakes Boulevard, West Palm Beach, Florida.
My name is Joe Kozak. I am the videographer. The court reporter is Cindy Hopkins from Prose, Prose Court Reporting Agency.
Will counsel please introduce yourselves, and then the court reporter will swear in the witnesses.
MR. CRITTON: Bob Critton on behalf of the

From: Steven Victor MD [redacted]
Sent: 11/23/2012 1:06:38 PM
To: [redacted]
CC: [redacted]
Subject: Report on Stem Cells future

PUBLISHED: 22 NOVEMBER 2012

The view from the US: Stem cell therapy steps up a gear with first approval and improved political climate

Special Report

Peter Winter

Positive clinical data, increases in federal funding and the first regulatory approval of a manufactured stem cell product mean momentum is building in the US. With the re-election of President Obama, this is likely to continue

Share on twitterShare on linkedinShare on facebookShare on email

Image: Bigstock

When US President Barack Obama came into office he made good on his promise to overturn President George W. Bush's executive order that - with the exception of a handful of existing stem cell lines - prohibited federal funding of human embryonic stem cell (hESC) research.

Special Report - Stem Cell Research under Horizon 2020

Stem Cell Research in Horizon 2020: **Experts debate what Europe must do to maintain its lead in regenerative medicine**
The view from the US: **Stem cell therapy steps up a gear with first approval and improved political climate**
View from Europe: **Delivering on the vision of regenerative medicine and stem cells**
Talking to the experts: **Why the EU should support human embryonic stem cell research in Horizon 2020**
OVERVIEW: Regenerate the future - human embryonic stem cell research is crucial to deliver health and growth

This easing of restrictions on hESC research was expected to engender enough confidence to attract investors into the space and encourage pharmaceutical and biotech companies to build robust product pipelines based on stem cell therapies. However, a tougher regulatory climate for biopharmaceuticals in general and a protracted legal challenge to the relaxing of rules on hESCs has served to keep both big pharma companies and venture capitalists on the sidelines to date.

Nevertheless, there has been progress, particularly at the research end of the development spectrum. Three and a half years on stem cells are no longer high on the political agenda as they once were. This speaks to the generally positive public acceptance of stem cell research in the US. **A Research!America poll** of likely voters in the presidential election, conducted in August 2012, found that 61 per cent of prospective voters were in favor of expanding funding for hESC research.

Investor interest

Looking back over his first term in office Obama can point to some major gains. These include funding increases for the National Institutes of Health's (NIH) stem cell initiatives, and greater investor interest in the wider field of regenerative medicine including the use of adult stem cells and induced pluripotent stem (iPS) cells.

However, it hasn't all been smooth sailing. Although after protracted forethought, the US Food and Drug Administration (FDA) gave the green light for the Californian biotech Geron to begin the very first human clinical trial of a human embryonic stem cell-derived therapy in January 2009, the trial has not been without its problems.

The Phase I trial, treating patients with acute spinal cord injury, was hit with an FDA clinical hold causing significant delays to its initiation in 2010. A year later, after 15 years' effort, the Geron washed its hands of the programme, blaming its withdrawal from the stem cell space on capital scarcity and uncertain economic conditions. The decision wiped out a leading player in hESC translation and commercialisation. However, the regenerative medicine sector has been able to recover and is beginning to blossom. (See Public Markets section below). The prime movers in the Geron trial are now attempting to revive it.

Research funding robust

Federal funding for all forms of stem cell research has increased over the past four years. However, the NIH funding component for hESC has been dogged by litigation for the past three years. In Sherley v. Sebelius, researchers James Sherley and Theresa Deisher, who worked with adult stem cells, claimed the NIH guidelines violated the Dickey-Wicker Amendment, which prohibits the use of federal funds for research in which human embryos are destroyed or discarded. This overhang was not finally removed until August 2012 when a three-judge panel from the US Court of Appeals for the District of Columbia Circuit unanimously upheld the NIH 2009 guidelines that permit funding of hESC research.

Through its Common Fund the NIH has established the Center for Regenerative Medicine (NIH CRM), to support this field, with the goal of accelerating the translation of stem cell-based clinical therapies.

State funding filling the void

With stem cell research in general not attracting a significant amount of venture funding, the California Institute of Regenerative Medicine (CIRM), which was established in 2004 with $3 billion for stem cell research at California universities and research institutions, has begun to fill the void left by traditional venture capital firms. To date CIRM has allocated $150 million in funding to help move promising stem cell-based therapies from the bench into clinical trials.

"We are a lot closer to having promising therapies ready for clinical trials, so it makes sense that we step up our engagement with industry to help fund those trials and move those therapies closer to approval by the FDA," said Duane Roth, vice chair of the governing board of CIRM.

CIRM's funding for translational research is good news for biotech companies, providing them with a source of funds in a field where it remains challenging to raise private capital.

Three biotech companies have been funded so far under CIRM's Strategic Partnership Awards initiative. A grant of $10.1 million was awarded to ViaCyte Inc. to continue preclinical research and initiate clinical testing of an embryonic stem cell-based therapy for patients with insulin-dependent diabetes.

Meanwhile, Bluebird Bio Inc. will use a $9.3 million grant to support a Phase I/II study to evaluate the safety and efficacy of LentiGlobin, the company's programme for the treatment of the inherited blood disorder beta-thalassemia, which will be initiated in the US in 2013.

StemCells Inc. has been awarded up to $20 million to fund preclinical development of its product consisting of purified human neural stem cells for treating Alzheimer's disease, with the goal of filing for permission to carry out a clinical trial in that time. In July, CIRM approved a separate award to the company for up to $20 million to fund preclinical development of a cell therapy for spinal cord injury.

Public Markets

It has been a good year for stem cell companies on the public markets, with the thirteen publicly-listed stem cell companies showing an average increase in share price of 11.6 percent in the year-to-date.

This boost came from a regulatory approval and positive clinical trials results. It was a big breakthrough for the field as a whole when the Canadian regulator Health Canada approved Prochymal, Osiris Therapeutics Inc.'s allogeneic stem cell treatment for graft-vs.-host disease (GvHD) in children.

The decision marked the world's first regulatory approval of a manufactured stem cell product and the first therapy approved for GvHD – a devastating complication of bone marrow transplantation that kills up to 80 percent of children affected, many within just weeks of diagnosis. The company's stock value has almost doubled in the course of this year.

Meanwhile, Newark, California-based StemCells, Inc. has seen its shares rise 148 per cent in the year to date. In addition to its CIRM grants, the company recently reported clinical and preclinical data demonstrating the therapeutic potential of a cell therapy for treating myelination disorders.

Pluristem Therapeutics Inc.'s stock value also has jumped 44 per cent, on the strength of reporting a single case study in which a patient with aplastic bone marrow who received an intramuscular injection of its PLacental eXpanded cells under compassionate use saw an improvement. The company was also able to successfully complete a public offering which netted about US$30 million.

Positive clinical trials will begin to encourage investment

While still in their early stages of development - and with clinical trials having only involved a limited number of patients - reports to date have been very promising, and provide further validation for encouraging investment in stem cell therapeutics. For example, data from a human embryonic stem cell trial conducted by Advanced Cell Technology and published in medical journal The Lancet, showed that two patients with Stargardt's disease, a degenerative eye condition, had regained some vision.

In addition, positive early data from a spinal cord injury trial involving StemCells' neural stem cells indicated that two patients with no feeling below the site of injury were able to regain sensation, while in another study from the company, patients with a rare myelination disorder were able to create myelin, an advance that holds promise for treating multiple sclerosis and cerebral palsy.

This scientific progress has helped breath a new sense of optimism into the US stem cell sector. The Fiscal Cliff apart, it seems likely this momentum will continue now Obama has secured a second term.

Peter Winter is a writer, editor and analyst on the global biotechnology industry. He is currently editor of BioWorld Insight.

Steven Victor MD
IntelliCell BioSciences
Chairman/CEO
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New York, New York 10022
[redacted]
www.IntelliCellBioSciences.com
[redacted]

From: Ian Osborne [redacted]
Sent: 11/28/2012 5:55:14 PM
To: Jeffrey Epstein [jeevacation@gmail.com]
Subject: Fwd: Invite to Dialog 2014 (16 months away)

Importance: High

Same shit. Peter doesn't even attend. I will tell him that he should stop them using his name.

Begin forwarded message:

From: "Auren Hoffman" <[redacted]>
Subject: Invite to Dialog 2014 (16 months away)
Date: 28 November 2012 16:05:59 GMT
To: [redacted]>

Dear Ian –

You are invited to join us at Dialog 2014 -- a two-day bipartisan retreat discussing how to change the world.

You were nominated for Dialog by Chamath Palihapitiya.

There will be no speeches … just many moderated break-out discussions of 6-15 people on various topics. And we design the agenda around your ideas and needs.

Please let us know if you would like to join us,

- Peter Thiel and Auren Hoffman

p.s. and yes, we know Dialog 2014 is 16 months away, but we are giving you a chance to sign up now

DETAILS:

You're invited to join us at the Dialog Retreat ... 150 people to change the world ... a participatory and entrepreneurial conversation on changing the world.

The **Dialog** participants aren't modest. We want to change the world.
But we don't want to spend our time being in a large audience listening to winded speeches. There are no speakers. No panels. All attendees participate in break-out facilitated discussions. And we **limit the discussion to only 150 global leaders** who can have an impact now and emerging leaders who can help implement the plans we develop.

Dates: March 13-15, 2014
Location: Sundance Resort, Utah (40 minutes from the Salt Lake City airport)
We've rented out the entire resort

Register at:
http://dialog2014.eventbrite.com
password: dialog2014
You qualify for a significant discount on the retreat fee. On the registration page, click on the link that says 'Enter promotional code' and enter:
GovtEmployee

note: the invite is only for Ian Osborne and is not transferable as we are limited to only 150 participants. There are no sponsors. We increase the retreat fee weekly to reward the people that sign up early. And this retreat is 100% off-the-record.

We hope you can join us.

Dialog participants…

… partial list of people who will be participating in the 2013 Dialog Retreat (all are references):

Veronica Allende Serra – Founding Partner, Pacific Investments. Chm, Portal de Documentos. Boards: Allied Advanced Technologies, Wow! Nutrition, Mercado Libre, ISmart Foundation.

Susan Athey -- Professor of Economics, Harvard University. Chief Economist, Microsoft. 2007 Winner of John Bates. Clark Medal.

Byron Auguste -- Director and Head of Social Sector Office, McKinsey & Co. Chm, Hope Street Group. Boards: William and Flora Hewlett Foundation; Pacific Council on International Policy; Center for American Progress.

David Barron – Professor, Harvard Law School. Fmr Acting Asst U.S. Attorney General in the Office of Legal Counsel.

Kirsten Bartok -- CEO, AirFinance. Fmr CFO of XOJet. Fmr GP at Alpine Investors.

Evan Bayh – Sr Advisor, Apollo Management. Partner, McGuireWoods. Fmr U.S. Senator (D-IN) (1999-2011). Fmr Governor of Indiana (1989-1997). Author, *From Father to Son*.

Tom Bedecarre – CEO, AKQA.

Nick Beim – GP, Matrix. Boards: Gilt Groupe, TheLadders, Care.com, Conductor, Intent Media, BuyWithMe.

Nicolas Berggruen -- President, Berggruen Holdings.

Charles Best – CEO, DononrsChoose.

Elizabeth Blackburn – Prof of Biology and Physiology, UCSF. 2009 Winner of Nobel Prize in Medicine. President, American Association of Cancer Research.

David Bonderman – Founding Partner, Texas Pacific Group (TPG). Founding Partner, Newbridge Capital. Boards: Continental Airlines, Bowe Bell & Howell, Ducati Motorcycles, Credicom Asia, National Education Corp, Beringer Wine, Carr Reality, Virgin Cinemas, CoStar Group, GemAlto, RyanAir Holdings, Wilderness Society, World Wildlife Fund.

Jason Bordoff – Senior Advisor for Energy and Environmental Policy to U.S. President Obama.

Erik Brynjolfsson – Prof of Economics, MIT Sloan School of Management. Director, MIT Center for Digital Business. Chair, *MIT Sloan Management Review*. Author, *Race Against the Machine*.

John Burbank – CEO, Passport Capital.

John Burbank – President, Nielsen Strategic Initiatives. Fmr CEO of Online, Nielsen. Fmr CMO, Nielsen. Fmr CMO, AOL.

Leah Busque – Founder, TaskRabbit.

Marc Cenedella – CEO, TheLadders.

Stephen Cohen – cofounder, Palantir.

Gio Colella – CEO, Castlight Health. Fmr CEO, RelayHealth.

Mark Colodny – Managing Director, Warburg Pincus. Boards: CAMP Systems, GlobalSpec, MLM Information, iParadigms, MultiView, A Place for Mom, EVIDON, eCert, Spigit, OnTargetJobs.

Boykin Curry -- Managing Director, Eagle Capital. Creator of Playa Grande. Cofndr, Girls Prep. Boards: Alliance for School Choice, Democrats for Education Reform.

Adam D'Angelo – CEO, Quora. Fmr CTO, Facebook.

Mitch Daniels – President, Purdue University. Governor, State of Indiana (2005-2013). Fmr Director, Office of Management and Budget (2001-2003).

Lanny Davis -- Fmr Special Counsel to the President (under Clinton). Author of Scandal and The Emerging Democratic Majority.

Ken Denman – CEO, Machine Perception Technologies. Fmr CEO of Openwave. Fmr CEO of iPass (IPAS). Fmr CEO, AuraServ Communications. Fmr SVP MediaOne. National Markets.

Marc Ecko – Chief Creative Officer, Marc Ecko Enterprises. Award-winning artist.

RP Eddy – CEO, Ergo. Fmr Director, White House National Security Council. Fmr Chief of Staff to U.N. Ambassador Richard Holbrooke. Sr Fellow, Manhattan Institute.

Juan Enriquez – CEO, Biotechonomy. Founding Director of the Life Sciences Project, Harvard Business School. Boards: Cabot Corp, Craig Venter Institute. Fmr CEO, Mexico City 's Urban Development Corporation.

Jeff Epstein – fmr CFO, Oracle. Fmr CFO, DoubleClick. Fmr CFO, King World Productions. Boards: Priceline.com, Stanford University Hospital.

Niall Ferguson – Prof History, Harvard. Author of *The World's Banker: The History of the House of Rothschild*, *The Cash Nexus*, *Empire, Colossus*, *The War of the World, The Ascent of Money*, and others.

Brad Garlinghouse – CEO, YouSendIt.

Julius Genachowski – Chairman, Federal Communications Commission (FCC).

Jared Genser – MD, Persesus Strategies. Founder, Freedom Now. International lawyer for Aung San Suu Kyi.

Jeff George – Global Head, Sandoz. Member of Exec Committee, Novartis.

Dave Goldberg – CEO, SurveyMonkey.

Tom Goldstein -- Partner, Goldstein & Howe. Fmr Partner and head of Supreme Court practice, Akin Gump. Has argued over 20 cases before Supreme Court. CEO, SCOTUSblog.

Fabrice Grinda -- CEO, OLX. Fmr fndr and CEO, Zingy. Fmr CEO, Aucland.

Ash Gupta – Chief Risk Officer, American Express.

Richard Haass – President, Council on Foreign Relations. Fmr Director of Policy Planning, U.S. State Department. Fmr U.S. Special Envoy to Northern Ireland.

Victor Halberstadt – Prof of Economics, Leiden University (Netherlands). Fmr President, International Institute of Public Finance. Mbr, Investment Committee, ABP Pension Fund. Boards: RHJ Internationall.

Janet Hanson – CEO, 85Broads.

Hollie Moore Haynes – MD, Silver Lake Partners.

Bob Hertzberg -- Chairman, G24 Innovations. Partner, Mayer Brown Rowe & Maw. Fmr Speaker, California State Assembly (2000-2002). Fmr Regent, University of California. Fmr Chm, Mayor Antonio Villaraigosa transition team. Board: Solar Integrated Technologies (Chm), California Historical Society, MALDEF, Town Hall Los Angeles, Century Housing.

Jim Himes – U.S. Congressman (D-CT).

Auren Hoffman -- CEO of LiveRamp. Chm, Rapleaf. Curator, Dialog Retreat. Board: Retargeter.

Reid Hoffman – Chairman and founder, LinkedIn. Partner, Greylock. Boards: DoSomething, Kiva, Endeavor Global, Mozilla. Zynga.

Jacob Hsu – CEO, Symbio.

Daisuke Iwase – cofounder and COO, Lifenet Insurance (top life insurance company in Japan).

Christian Johansson – Secretary of Department of Business and Economic Development (DBED), State of Maryland. Fmr CEO, Economic Alliance of Greater Baltimore.

David Kamenetzky – Group Head, Mars & Co.

PV Kannan – CEO, 24/7 Customer.

Andy Karsner – CEO, Manifest Energy. Fmr U.S. Asst Sec of Energy for Energy Efficiency and Renewable Energy (2005-2009). Fmr Managing Director, Enercorp. Boards: Applied Materials, Conservation International.

Garry Kasporov – Fmr World Chess Champion. Chm, United Civil Front of Russia.

Neal Katyal – Partner, Hogan Lovells. Fmr Acting Solicitor General for the United States (2010-2011). Professor of Law, Georgetown U. Lead counsel for the plaintiff in Supreme Court case Hamdan vs. Rumsfeld.

Terry Kawaja – CEO, Luma Partners.

Juliette Kayyem – Foreign Affairs Columnist, Boston Globe. Lecturer in Public Policy, Harvard. Asst Sec. for Intergovernmental Affairs, U.S. Dept. of Homeland Security.

Jeff Kearl – Chm, SkullCandy.

Peter Kellner -- MD, Richmond Management. Cofounder, Endeavor. Fmr partner, Vectis Group.

Chris Kelly -- Fmr Chief Privacy Officer and Head of Global Public Policy at Facebook . Fmr Chief Privacy Office, Excite@Home.

Pradeep Khosla – Chancellor, UC San Diego. Fmr Dean of College of Engineering, Carnegie Mellon. Boards: Quantpoint, BioMatricore, BitArmor, Children's Institute, IIT Foundation, Mellon-Pitt Corp.

Charlie Kim – CEO, NextJump.

David Kirkpatrick – Author, *The Facebook Effect*. Fmr head technology writer, FORTUNE.

Henry Kravis – Co-CEO of KKR. Chm, First Data. Boards: Claremont McKenna College, Metropolitan Museum of Art, Mount Sinai Medical Center, Council on Foreign Relations, Columbia Business School, Rockefeller University, others. Fmr Chair, Partnership for New York City.

Marie-Josee Kravis – Boards: Publicis, LVMH. Boards: Memorial Sloan-Kettering Cancer Center, Robin Hood Foundation, Council on Foreign Relations, Qatar Museum Authority. President, Museum of Modern Art board of directors. Fmr Board: Ford, IAC, CIBC.

Will Lansing – CEO, FICO (NYSE: FICO). Fmr CEO, InfoSpace. Fmr CEO, NBC Internet. Fmr COO, Prodigy Communications.

Renaud Laplanche – CEO, Lending Club.

Laura and Gary Lauder -- General Partners, Lauder Partners. Cofndrs, Socrates Society.

Jenna Lee – Anchor, Fox News. Host, *Happening Now* on Fox News.

Jorge Lemann – Fmr Owner, AmBev (largest brewery in Latin America) and now one of the largest shareholders in Anheuser-Busch InBev. Boards: Lojas Americanas, Gillette, Swiss Re, Burger King.

Max Levchin – fmr CEO, Slide. Fmr co-founder, PayPal.

Jonathan Levin – Prof and Chair of Dept of Economics, Stanford. 2011 Winner of the John Bates Clark Medal.

Ann Lewis – President, NoLimits. Fmr Director of Communications to the U.S. President (1997-2000).

Rob LoCasio – CEO, LivePerson (NASDAQ: LSPN).

Jeremy Liew – GP, LightSpeed Venture Partners. Investor in: Bonobos, CarDomain, Flixster, Focus, Kixeye, Kongregate, LivingSocial, Playdom, RockYou, ShoeDazzle, and others.

Joe Lonsdale – CEO, Adepar. cofounder, Palantir.

Doreen Lorenzo – President, Frog Design.

Bob Luskin -- Partner and Co-Chair of Litigation Dept, Patton Boggs. Attorney to Karl Rove and Lance Armstrong. Fmr Chief Counsel to the Organized Crime & Racketeering Section of DOJ .

Jorn Lyseggen – CEO of Meltwater.

John Maeda – President, Rhode Island School of Design. Author, *Laws of Simplicity.*

Divesh Makan – CEO, Iconiq Capital.

Meyer Malka – co-CEO, Lemon.

Andy McAfee – Principal Research Scientist at the Center for Digital Business, MIT. Author of *Race Against the Machine.*

General Stan McChrystal – Ret. 4-star U.S. General. Led all U.S. forces in Afghanistan. Fmr Commander, Joint Special Operations Command. Current Principal, McChrystal Group. Sr. Fellow, Yale's Jackson Institute for Global Affairs.

Andrew McLaughlin – Fmr VP, Tumblr. Fmr Deputy CTO of the United States, White House. Fmr Dir of Public Policy, Google. Boards: Public Knowledge, Code for America.

Dmitri Mehlhorn – COO, StudentsFirst.

Lenny Mendonca -- Director, McKinsey. Head of McKinsey's strategy practice. Chm, McKinsey Global Institute. Chm, Bay Area Council. Board: McKinsey & Co, Economic Institute of the Bay Area, Bay Area Science and Innovation Consortium, The New America Foundation, Common Cause, Committee for Economic Development, ChildrenNow, and DonorsChoose.

Eugene Meyer – President, Federalist Society.

Chris Michel – GP, Nautilus Ventures. Award-winning photographer. Fmr CEO, Affinity Labs. Fmr CEO, Military.com. Boards: International Data Group, Dale Carnegie, Kixeye, Castlight Health, USO, Marine Corps University Foundation.

Katie Mitic – Fmr Head of Platform Marketing, Facebook. Fmr SVP, Palm. Fmr VP Product Strategy, Yahoo! Fmr Fndr and CEO, Four11. Boards: eBay, Special Olympics International.

Wes Moore -- Author, "The Other Wes Moore". Fmr. Special Assistant to Secretary of State Rice. Fmr Director of Information Operations, 82nd Airborne Division, US Army, Afghanistan 2005-2006.

Nader Mousavizadeh – CEO of Oxford Analytica.

Luke Muehlhauser – Exec Director, Singularity University.

Matt Mullenweg – Founder, Wordpress.

Roger Myerson -- Prof of Economics, U of Chicago. 2007 winner of Nobel Prize in Economics.

Scott Nathan – Partner, Baupost Group.

Meghan O'Sullivan -- Professor, Harvard Kennedy School of Govt. Fmr Deputy National Security Advisor for Iraq and Afghanistan, President George W. Bush. Mbr, Trilateral Commission.

Chamath Palihapitiya – CEO, Social+Capital. fmr VP Growth, Mobile, and International at Facebook. Fmr GM of AIM at AOL. Boards: SecondMarket, FixYa, Lemon, Integrated Plasmonics. Co-Owner, Golden State Warriors.

Eli Pariser – Fmr President, MoveOn. Cofndr, Avaaz.org. Boards: MoveOn, Avaaz, New Organizing Institute and Simon's Rock College.

Mark Penn – Corp VP of Strategic Projects (reports to the CEO), Microsoft. Fmr CEO, Burson-Marsteller. President, of polling firm Penn, Schoen and Berland Associates. Fmr Chief Strategist, Hillary Clinton for President 2008. Author, Microtrends. Fmr pollster to President Clinton. Fmr pollster to Prime Minister Tony Blair.

Lois Quam – Executive Director, Global Health Initiative – part of the State Department and she reports directly to Secretary Clinton. Fmr CEO of Public and Senior Markets, UnitedHealth Group ($30 billion division).

Dan Rosensweig – CEO, Chegg. Fmr CEO, Guitar Hero. Fmr COO, Yahoo.

Robert Rubin – Co-Chairman, Council on Foreign Relations. Fmr U.S. Secretary of the Treasury (1995-1999). Fmr Director, National Economic Council (1993-1995). Chm, Local Initiatives Support Corporation (LISC). Fmr Co-Chairman, Goldman Sachs.

Sal Russo – Founder, Tea Party Express. Partner, Russo Marsh.

Tod Sacerdoti – CEO, BrightRoll. Board: ReTargeter.

Amy Salzhauer – CEO, Ignition.

Cami Samuels – General Partner, Versant Ventures. Boards: Achaogen, APT Pharmaceuticals, Kythera Biopharmaceuticals, Semprae Laboratories.

Ken Sawyer -- CEO, Saints Ventures (manages over $1 billion in capital). Selected to Forbes Midas List. Boards: Continuous Computing, HK Systems, Cleargauge, Travel Intelligence, Envivio, Alliance Consulting, Acsis and Laureate Pharmaceuticals.

Jessica Schell – EVP BD and Strategic Planning, Universal Pictures. Fmr SVP Digital Strategy and Business Development, NBC Universal. Board: World Wide Biggies.

Barry Silbert – CEO of SecondMarket.

Josh Silverman – President of US Consumer Services, American Express. Fmr CEO, Skype. Fmr CEO, Shopping.com. Fmr CEO and Fndr, eVite.

Sukhinder Singh Cassidy – Chm, JOYUS. Fmr CEO, Polyvore. Fmr President of Asia Pacific and Latin America, Google. Boards: TripAdvisor (TRIP) and Formspring.

Megan Smith – VP Business Development, Google. Fmr CEO, PlanetOut.

Charles Songhurst -- GM and Head of Strategy and M&A, Microsoft. MD, Katana Capital.

Angelo Sotira – CEO, DeviantArt.

Bret Stephens -- Member of Editorial Board, Wall Street Journal. Main Foreign Affairs Columnist, Wall Street Journal. Fmr Editor-in-Chief, Jerusalem Post.

Simon Stevens – EVP, UnitedHealth Group. Fmr CEO, Ovations (revenues of $31 billion). Fmr Health Policy Director to British Prime Minister Tony Blair.

Henry Sweica – CEO, Talpion Fund Management. Fmr co-founder, Highbridge Capital Management.

Alexander Tamas - Partner, DST. Boards: Forticom, mail.ru

Peter Thiel -- CEO of Thiel Capital. Managing Director, Founders Fund. Fmr founder and CEO of PayPal. Boards: Facebook and Palantir.

Steve Wayne – CEO, Jensen Group.

Will Wechsler – Deputy Asst. Sec of Defense for Counternarcotics and Global Threats.

Adam Weiss – co-CEO, Scout Capital.

Katharine Weymouth – Publisher, Washington Post.

Michael Wolf – CEO, Activate. fmr President and COO, MTV Networks. Fmr Prtnr, McKinsey. Former Senior Partner, Booz Allen & Hamilton.

Paul Wolpe – Director, Center of Ethics. Prof of Bioethics, Emory. Sr Bioethicist, NASA. Co-Editor, American Journal of Bioethics.

Jed York – CEO of San Francisco 49ers.

Lauren Zalaznick – Chairman, Entertainment & Digital Networks and Integrated Media, NBCUniversal. She oversees Bravo, Oxygen Media, Style, PBS Sprout, Telemundo, iVillage, Swirl, Daily Candy, and Fandango.

Eric Zinterhofer – co-CEO, Searchlight Capital. Chm, Charter Communications. Fmr Sr Partner, Apollo Management. Boards: Central European Media Enterprises, Dish TV India.

Karl-Theodor zu Guttenberg – fmr Minister of Defense, Germany. Fmr Minister of Economics and Technology, Germany.

AFFIDAVIT OF BRADLEY JAMES EDWARDS

1. I am an attorney in good standing with the Florida Bar and admitted to practice in the Southern District of Florida. I am a partner in the law firm of Farmer Jaffe Weissing Edwards Fistos and Lehrman.

2. I am the lead attorney currently representing "Jane Doe" in the case of Jane Doe v. Jeffrey Epstein, case number 08-80893 in federal Court in the Southern District of Florida. I am the lead attorney representing Jane Doe, whose civil complaint alleges that Epstein sexually molested her numerous occasions when she was a minor.

3. Defendant Epstein has entered into a "non-prosecution agreement" (NPA) with the federal government for sex crimes against minors. Under that agreement, the federal government has agreed not to file criminal charges against Epstein for sex crimes committed against approximately thirty girls, including Jane Doe. In exchange, Epstein agreed to plead guilty to state law criminal charges involving solicitation of prostitution and procuring a minor for prostitution. The victim of the criminal charges to which he has pled was not Jane Doe.

4. Under the NPA, Epstein has agreed not to contest civil liability of any of his approximately thirty victims – provided that the victim agrees to limit themselves to the damages provided by 18 U.S.C. § 2255 (currently set at $150,000). Jane Doe has not agreed to limit herself to pursuing only $150,000 in damages. Therefore, the terms of the NPA purport to prevent Jane Doe from using the NPA to prove liability.

5. Epstein has filed an answer to Jane Doe's complaint, in which he has invoked his Fifth Amendment right to silence with respect to the allegations that he molested her as a child. Epstein has further argued that this Fifth Amendment invocation is the functional equivalent of, and must be treated as, a specific denial of the allegations.

6. Defendant Epstein's deposition has been taken on several occasions, in this and other related cases, and he has not provided any substantive discovery whatsoever. Instead, he invoked his 5th amendment privilege against self-incrimination when asked questions about his abuse of Jane Doe or other girls.

7. Defendant Epstein has also been served with Interrogatories and requests for production; all requests have been met with 5th amendment assertions and Epstein has not given Jane Doe any substantive testimony related her allegations.

8. Jane Doe's complaint contains a punitive damages claim, and Mr. Epstein has also elected to invoke the 5th Amendment on all questions that would relate to punitive damages issues, such as his intent when committing the crimes, his lack of remorse and his intent to recidivate.

9. Epstein has taken Jane Doe's deposition. During that deposition he has asked numerous questions of Jane Doe that suggest that she is fabricating her allegation of abuse by Epstein.

10. In addition to deposing Mr. Epstein, other attorneys and I have taken the depositions of his various co-conspirators (as labeled by the federal government in the NPA), including [redacted], [redacted] and [redacted] Each of those individuals was employed by Epstein to bring him underage girls for him to molest and to ensure that he was protected from detection by law enforcement, and thus those individuals could likely provide general testimony that would assist Plaintiff in proving liability and damages, including punitive damages. However, none of these individuals were

present during acts of sexual abuse by Epstein. In any event, ALL of those individuals have also invoked their 5th amendment rights against self-incrimination, and thus have left Plaintiff with no information about what Epstein or other conspirators inside his house were doing during the sexual abuse of Jane Doe and other minors girls. This creates a serious issue for Jane Doe in proving her sexual molestation claim against Epstein. By its nature, sexual molestation takes place in private, with only the abuser and the victim typically available to testify. In this case, Epstein's abuse of Jane Doe took place in private, with only Epstein and Jane Doe present during the abuse. Jane Doe has no other reasonable avenues of discovery to provide direct proof of claim of sexual abuse by Epstein.

11. Additionally, Mr. Epstein has recently filed a lawsuit against me personally that has no merit whatsoever, a fact known to Mr. Epstein and his attorneys. He filed the lawsuit against Brad Edwards, Scott Rothstein, and L.M. (another Epstein victim of his molestation). That lawsuit implies that [redacted]'s civil case against him (currently pending in Florida state court) is fabricated and that [redacted] and I have conspired to commit fraud against him (presumably that she made up the case against him, implying that he does not know [redacted]. While the present subpoena before the Court has been filed by Jane Doe, the Court should be aware that attorneys representing [redacted] may also file a subpoena for the George Rush tape shortly.

12. Despite Mr. Epstein and all of his co-conspirators, asserting a 5th amendment privilege against self-incrimination, George Rush of the New York Daily news did contact me to inform me that Mr. Epstein spoke personally with him about issues related to the various charges of sex abuse against him.

13. Paraphrasing from memory of my conversation with Mr. Rush, Mr. Epstein told him that he may have come "too close to the line" but that he should not have been punished as severely as he was and that his conduct was at most worthy of a $100 fine. This is a statement that shows two things of great importance to Jane Doe's pending civil action. First, it is in effect an admission by Epstein of his liability to Jane Doe for sexually abusing her. Jane Doe does not have any other admission of Epstein of his sexual abuse of her and Epstein has filed an answer to Jane Doe's complaint that has the functional effect of denying abuse of her. Jane Doe has diligently pursued all possible ways of obtaining an admission from Epstein of his molestation of Jane Doe without success. Second, the statement to Mr. Rush is a clear demonstration that Epstein lacks remorse for committing felony child molestation against Jane Doe. This will be a central issue in the punitive damages case against Epstein at trial. Here again, Jane Doe has diligently pursued all possible ways of obtaining a statement from Epstein about his lack of remorse for abusing Jane Doe without success. There are no other reasonable means of obtaining a statement from Epstein on these subjects.

14. Mr. Rush also told me that Mr. Epstein spoke specifically about one of my clients, [redacted], and he made derogatory remarks about her.

15. Additionally, Mr. Rush said that Epstein spoke directly about another civil case that was filed against him (Jane Doe 102 v. Epstein); that case alleges that Epstein repeatedly sexually abused a 15 year old girl, forced her to have sex with his friends and flew her on his private plane nationally and internationally for the purposes of sexually molesting and abusing her. Epstein flippantly told George Rush that that case was dismissed, in a way to indicate that the allegations are ridiculous and untrue.

16. Mr. Rush indicated that he taped the conversation between him and Mr. Epstein.

17. Mr. Rush also spoke at length to Michael Fisten, an investigator with my firm that was assisting with the investigation of the case. Mr. Fisten reported to me shortly after the conversation with Mr. Rush that he had such a conversation.

18. While research by other plaintiffs' attorneys and myself has uncovered other persons that were acquaintances of Mr. Epstein, specifically Donald Trump, Alan Dershowitz, Bill Clinton, Tommy Mottola, and David Copperfield, we have no information that any of those people (other than Mr. Dershowitz) have spoken to Mr. Epstein about Jane Doe or any of the other specific victims of Mr. Epstein's molestation. Mr. Dershowitz is acting as an attorney for Mr. Epstein, and therefore it is presumably unlikely to question him about any admissions that Epstein may have made regarding Jane Doe or other minors girls. Additionally, we have no information that any of those individuals or any other individuals have any taped statements of Epstein's own voice relating to these matters. George Rush's taped conversation with Mr. Epstein is the only known one in existence, making it very unique and it contains information not otherwise obtainable through other means or sources. Indeed, without the Rush tape conversation, the jury that handles the case will not hear any words from Epstein himself about his abuse of Jane Doe and other young girls. I have been informed by Epstein's attorney that Epstein intends to invoke his Fifth Amendment rights rather than answer any substantive questions about the abuse of Jane Doe and other girls at trial.

19. The Rush interview is, in any event, unique and not otherwise obtainable from other witnesses because it can be used to prove perjury (a federal crime) on the part of Epstein. Epstein lied about not knowing George Rush. See deposition of Jeffrey Epstein, taken in [redacted] v. Jeffrey Epstein, case 50-2008-CA-028051, page 154, line 4 through 155 line 9, wherein Jeffrey Epstein clearly impresses that he does not recognize George Rush from the New York Daily News, despite the fact that he gave a personal interview that we all now know to have been tape recorded. It is therefore evidence of a criminal event. If we receive the tape, we intend to alert the appropriate law enforcement authorities, both federal and state, so that they can pursue any appropriate criminal investigation perjury charges.

20. The tape is also crucial for [redacted] to dismiss the frivolous complaint filed by Jeffrey Epstein against her, as he clearly acknowledges knowing [redacted], contrary to claims he makes in his complaint against her and also contradictory to other statements he has made in depositions related to knowing L.M. In that regard, this tape provides evidence of other false statements Epstein has made under oath.

21. During a telephone call with George Rush, he provided me more than a description of the tape, and in fact described the general tenor of the entire interview, so that nothing in the interview can be fairly regarded as confidential at this point.

22. As George Rush admitted in his affidavit, he played the tape for *at least* two other persons who also confirmed Epstein's arrogance as he speaks about his actions with minors.

23. The people for whom George Rush played the tape or told in detail of the information on the tape were not "sources" in the tradition sense of the word – all individuals were simply chatting with Mr. Rush about Mr. Epstein and his propensity to molest children. For example, when I discussed the tape with Mr. Rush, I was not a "source" in the traditional sense of that term. At no point did Mr. Rush tell me that I was a "source" for his reporting.

24. Because Epstein and all other co-conspirators have invoked the 5th amendment as to all relevant questions, this tape is the *only* way that Jane Doe can put Epstein's own perceptions of what he has done before the jury and the only way that Jane Doe can put Epstein's admissions and statement s before the jury. As even a quick perusal of the more than 500 entries on the docket sheet for Jane Doe's (consolidated) case will confirm (see Case no. 9:08-80119 (S.D. Fla.) (case number for consolidated cases on discovery), Jane Doe and other plaintiffs have made exhaustive attempts to obtain information from Epstein about his abuse. These attempts have included repeated requests for admission, requests for production, interrogatories, and depositions – all the means that are listed in the Federal Rules of Civil Procedure for obtaining discovery. These means have all been exhausted without success. Neither

Jane Doe nor any of the other plaintiffs have been able to obtain even a single word of information from Epstein about his abuse of minor girls.

25. I made a good faith, albeit unsuccessful, effort to resolve this matter with Anne B. Carroll, representing the Daily News in order to avoid any court intervention. I explained that we needed this tape for several reasons, including those cited by her in her pleading. The tape is detrimental to Epstein's personal complaint against [redacted] and me; the tape is evidence of perjury committed by Epstein; the tape is the Best Evidence of his lack of remorse for his actions and will be presented in the punitive damages phase of the civil trials against him; and, perhaps most important, the tape is the only way that the jury considering Jane Doe's case will be able to hear Epstein's voice and own statements about his abuse of Jane Doe and other minor girls. Without the tape, the jury will not have the opportunity to hear Epstein give any substantive information about Jane Doe's complaint. Indeed, they will not have the opportunity to even hear Epstein's voice utter any substantive words other than (in essence) "I take the Fifth." As part of our discussion, Ms. Carroll told me that it was a "stupid move" for Mr. Rush to play the tape or disclose the tape to other people as he likely waived any privilege and that, as a result of disclosing the tape, he was at risk of losing his job. I responded that it did not seem fair that Mr. Rush lose his job or be punished in any way, but that I had an absolute duty to represent my client and that I would be failing in that duty if I did not pursue this critical piece of evidence.

I declare under penalty of perjury that the foregoing is true and correct.

FURTHER AFFIANT SAYETH NAUGHT.

Dated this 23rd day of April, 2010.

Brad Edwards, Esq.

The foregoing instrument was acknowledged before me this 23rd day of April, 2010 by BRAD EDWARDS, who is personally known to me.

NOTARY PUBLIC

Print Name:____________________

My Commission Expires:

MARIA W. KELLJCHIAN
MY COMMISSION # DD 813393
EXPIRES: August 11, 2012
Bonded Thru Notary Public Underwriters

EXHIBIT N

AFFIDAVIT OF BRADLEY JAMES EDWARDS

1. I am an attorney in good standing with the Florida Bar and admitted to practice in the Southern District of Florida. I am currently a partner in the law firm of Farmer, Jaffe, Weissing, Edwards, Fistos & Lehrman, P.L.

2. In 2008, I was a sole practitioner running a personal injury law firm in Hollywood, FL. While a sole practitioner I was retained by three clients, [redacted], [redacted], and Jane Doe to pursue civil litigation against Jeffrey Epstein for sexually abusing them while they were minor girls. I agreed to represent these girls, along with attorney Jay Howell (an attorney in Jacksonville, Florida with Jay Howell & Associates) and Professor Paul Cassell (a law professor at the University of Utah College Of Law). I filed state court actions on behalf of [redacted]. and [redacted] and a federal court action on behalf of Jane Doe. All of the cases were filed in the summer of 2008.

3. My clients received correspondence from the U.S. Department of Justice regarding their rights as victims of Epstein's federal sex offenses. (True and accurate copies of the letters are attached to Statement of Undisputed Facts as Exhibit "M")

4. In mid June 2008, I contacted Assistant United States Attorney Marie Villafaña to inform her that I represented Jane Doe #1([redacted]) and, later, Jane Doe #2([redacted]. I asked to meet to provide information regarding Epstein. AUSA Villafaña did not advise me that a plea agreement had already been negotiated with Epstein's attorneys that would block federal prosecution. AUSA Villafaña did indicate that federal investigators had concrete evidence and information that Epstein had sexually molested at least 40 underage minor females, including [redacted], Jane Doe and [redacted]

5. I also requested from the U.S. Attorney's Office the information and evidence that they had collected regarding Epstein's sexual abuse of his clients. However, the U.S. Attorney's Office declined to provide any such information to me. The U.S. Attorney's Office also declined to provide any such information to the other attorneys who represented victims of Epstein's sexual assaults.

6. I was informed that on Friday, June 27, 2008, at approximately 4:15 p.m., AUSA Villafaña received a copy of Epstein's proposed state plea agreement and learned that the plea was scheduled for 8:30 a.m., Monday, June 30, 2008. She called me to provide notice to my clients regarding the hearing. She did not tell me that the guilty pleas in state court would bring an end to the possibility of federal prosecution pursuant to the plea agreement. My clients did not learn and understand this fact until July 11, 2008, when the agreement was described during a hearing held before Judge Marra on the Crime Victims' Rights Act action that I had filed.

7. In the summer of 2008 I filed complaints against Jeffrey Epstein on behalf of [redacted], [redacted], and Jane Doe.

8. In the Spring of 2009 (approximately April), I joined the law firm of Rothstein, Rosenfeldt and Adler, P.A. ("RRA"). I brought my existing clients with me when I joined RRA, including [redacted]., [redacted]., and Jane Doe. When I joined the firm, I was not aware that Scott Rothstein was running a Ponzi scheme at RRA. Had I known such a Ponzi scheme was in place, I would never have joined RRA.

9. I am now aware that it has been alleged that Scott Rothstein made fraudulent presentations to investors about the lawsuits that I had filed on behalf of my clients against Epstein and that it has been alleged that these lawsuits were used to fraudulently lure investors into Rothstein's Ponzi scheme. I never met a single investor, had no part in any such presentations and had no knowledge any such fraud was occurring. If these allegations are true, I had no knowledge that any such fraudulent presentations were occurring and no knowledge of any such improper use of the case files.

10. Epstein's Complaint against me alleges that Rothstein made false statements about cases filed against Epstein, i.e., that RRA had 50 anonymous females who had filed suit against Epstein; that Rothstein sold an interest in personal injury lawsuits, reached agreements to share attorneys fees with non-lawyers, paid clients "up front" money; and that he used the judicial process to further his Ponzi scheme. If Rothstein did any of these things, I had no knowledge of his actions. Because I maintained close contact with my clients, [redacted], [redacted] and Jane Doe, and Scott Rothstein never met any of them, I know for certain that none of my clients were paid "up front" money by anyone.

11. Epstein alleges that I attempted to take the depositions of his "high profile friends and acquaintances" for no legitimate litigation purpose. This is untrue, as all of my actions in representing [redacted]., [redacted]., and Jane Doe were aimed at providing them effective representation in their civil suits. With regard to Epstein's friends, through documents and information obtained in discovery and other means of investigation, I learned that Epstein was sexually molesting minor girls on a daily basis and had been for many years. I also learned the unsurprising fact that he was molesting the girls in the privacy of his mansion in West Palm Beach, meaning that locating witnesses to corroborate their testimony would be difficult to find. I also learned, from the course of the litigation, that Epstein and his lawyers were constantly attacking the credibility of the girls, that Epstein's employees were all represented by lawyers who apparently were paid for (directly or indirectly) by Epstein, that co-conspirators whose representation was also apparently paid for by Epstein were all taking the Fifth (like Epstein) rather than provide information in discovery. For example, I was given reason to believe that [redacted], Larry Visoski, Larry Harrison, David Rogers, Louella Rabuyo, [redacted] [redacted], Ghislaine Maxwell, Mark Epstein, and Janusz Banasiak all had lawyers paid for by Epstein. Because Epstein and the co-conspirators in his child molestation criminal enterprise blocked normal discovery avenues, I needed to search for other ordinary approaches to strengthen the cases of my clients. Consistent with my training and experience, these other ordinary approaches included finding other witnesses who could corroborate allegations of sexual abuse of my clients or other girls. Some of these witnesses were friends of Epstein. Given his social status, it also turned out that some of his friends were high-profile individuals.

12. In light of information I received suggesting that British socialite Ghislaine Maxwell, former girlfriend and long-time friend of Epstein's, was involved in managing Epstein's affairs and companies I had her served for deposition for August 17, 2009. (Deposition Notice attached to Statement of Undisputed Facts as Exhibit BB). Maxwell was represented by Brett Jaffe of the New York firm of Cohen and Gresser, and I understood that her attorney was paid for (directly or indirectly) by Epstein. She was reluctant to give her deposition, and I tried to work with her attorney to take her deposition on terms that would be acceptable to both sides. Her attorney and I negotiated a confidentiality agreement, under which Maxwell agreed to drop any objections to the deposition. Maxwell, however, still avoided the deposition. On June 29, 2010, one day before I was to fly to NY to take Maxwell's deposition, her attorney informed me that Maxwell's mother was deathly ill and Maxwell was consequently flying to England with no intention of returning and certainly would not return to the United States before the conclusion of Jane Doe's trial period (August 6, 2010). Despite that assertion, I later learned that Ghislaine Maxwell was in fact in the country on approximately July 31, 2010, as she attended the wedding of Chelsea Clinton (former President Clinton's daughter) and was captured in a photograph taken for US Weekly magazine.

13. Epstein alleges that there was something improper in the fact that I notified him that I intended to take Donald Trump's deposition in the civil suits against him. Trump was properly noticed because: (a) after review of the message pads confiscated from Epstein's home, the legal and investigative team assisting my clients learned that Trump called Epstein's West Palm Beach mansion on several occasions during the time period most relevant to my clients' complaints; (b) Trump was quoted in a *Vanity Fair* article about Epstein as saying **"I've known Jeff for fifteen years. Terrific guy." "He's a lot of fun to be with. It is even said that he likes beautiful women as much as I do, and many of them are on the younger side. No doubt about it – Jeffrey enjoys his social life."** Jeffrey Epstein: International Moneyman of Mystery; **He's pals with a passel of Nobel Prize–winning scientists, CEOs like Leslie Wexner of the Limited, socialite Ghislaine Maxwell, even Donald Trump. But it wasn't until he flew Bill Clinton, Kevin Spacey, and Chris Tucker to Africa on his private Boeing 727 that the world began to wonder who he is. By Landon Thomas Jr.**; (c) I learned through a source that Trump banned Epstein from his Maralago Club in West Palm Beach because Epstein sexually assaulted an underage girl at the club; (d) Jane Doe No. 102's complaint alleged that Jane Doe 102 was initially approached at Trump's Maralago by Ghislaine Maxwell and recruited to be Maxwell and Epstein's underage sex slave; (e) Mark Epstein (Jeffrey Epstein's brother) testified that Trump flew on Jeffrey Epstein's plane with him (the same plane that Jane Doe 102 alleged was used to have sex with underage girls) deposition of Mark Epstein, September 21, 2009 at 48-50; (f) Trump visited Epstein at his home in Palm Beach – the same home where Epstein abused minor girls daily; (g) Epstein's phone directory from his computer contains 14 phone numbers for Donald Trump, including emergency numbers, car numbers, and numbers to Trump's security guard and houseman. Based on this information, I believed that

Trump might have relevant information to provide in the cases against Jeffrey Epstein and accordingly provided notice of a possible deposition.

14. Epstein alleges that there was something improper in the fact that I notified him that I intended to take Alan Dershowitz's deposition in the civil suits against him. Dershowitz was properly noticed because: (a) Dershowitz has been friends with Epstein for many years; (b) in one news article Dershowitz comments that, "I'm on my 20th book... The only person outside of my immediate family that I send drafts to is Jeffrey" The Talented Mr. Epstein, By Vicky Ward on January, 2005 in Published Work, Vanity Fair; (c) Epstein's housekeeper Alfredo Rodriguez testified that Dershowitz stayed at Epstein's house during the years most relevant to my clients; (d) Rodriguez testified that Dershowitz was at Epstein's house at times when underage females where there being molested by Epstein (see Alfredo Rodriguez deposition at 278-280, 385, 426-427); (e) Dershowitz was reportedly involved in persuading the Palm Beach State Attorney's office not to file felony criminal charges against Epstein because the underage females lacked credibility and thus could not be believed that they were at Epstein's house, despite him being an eyewitness that the underage girls were actually there; (f) Jane Doe No. 102 stated generally that Epstein forced her to be sexually exploited by not only Epstein but also Epstein's "adult male peers, including royalty, politicians, academicians, businessmen, and/or other professional and personal acquaintances" – categories that Dershowitz and acquaintances of Dershowitz fall into; (g) during the years 2002-2005 Alan Dershowitz was on Epstein's plane on several occasions according to the flight logs produced by Epstein's pilot and information (described above) suggested that sexual assaults may have taken place on the plane; (h) Epstein donated Harvard $30 Million dollars one year, and Harvard was one of the only institutions that did not return Epstein's donation after he was charged with sex offenses against children. Based on this information, I believed that Dershowitz might have relevant information to provide in the cases against Jeffrey Epstein and accordingly provided notice of a possible deposition.

15. Epstein alleges that there was something improper in the fact that I notified him that I intended to take Bill Clinton's deposition. Clinton was properly noticed because: (a) it was well known that Clinton was friends with Ghislaine Maxwell, and several witnesses had provided information that Maxwell helped to run Epstein's companies, kept images of naked underage children on her computer, helped to recruit underage children for Epstein, engaged in lesbian sex with underage females that she procured for Epstein, and photographed underage females in sexually explicit poses and kept child pornography on her computer; (b) newpaper articles stated that Clinton had an affair with Ghislaine Maxwell, who was thought to be second in charge of Epstein's child molestation ring. The Cleveland Leader newspaper, April 10, 2009; (c) it was national news when Clinton traveled with Epstein (and Maxwell) aboard Epstein's private plane to Africa and the news articles classified Clinton as Epstein's friend; (d) the flight logs for the relevant years 2002 - 2005 showed Clinton traveling on Epstein's plane on more than 10 occasions and his assistant, Doug Band, traveled on many more occasions; (e) Jane Doe No. 102 stated generally that she was required by Epstein to be sexually

exploited by not only Epstein but also Epstein's "adult male peers, including royalty, politicians, academicians, businessmen, and/or other professional and personal acquaintances" – categories Clinton and acquaintances of Clinton fall into; (f) flight logs showed that Clinton took many flights with Epstein, Ghislaine Maxwell, [redacted] [redacted] and [redacted] -- all employees and/or co-conspirators of Epstein's that were closely connected to Epstein's child exploitation and sexual abuse; (g) Clinton frequently flew with Epstein aboard his plane, then suddenly stopped – raising the suspicion that the friendship abruptly ended, perhaps because of events related to Epstein's sexual abuse of children; (h) Epstein's personal phone directory from his computer contains e-mail addresses for Clinton along with 21 phone numbers for him, including those for his assistant (Doug Band), his schedulers, and what appear to be Clinton's personal numbers. Based on this information, I believed that Clinton might have relevant information to provide in the cases against Jeffrey Epstein and accordingly provided notice of a possible deposition.

16. Epstein alleges that Tommy Mottola was improperly noticed with a deposition. I did not notice Mattola for deposition. He was noticed for deposition by a law firm representing another one of Epstein's victims – not by me.

17. Epstein alleges that there was something improper in the fact that I notified him that I intended to take the illusionist David Copperfield's deposition. Copperfield was properly noticed because: (a) Epstein's housekeeper Alfredo Rodriguez testified that David Copperfield was a guest on several occasions at Epstein's house; (b) according to the message pads confiscated from Epstein's house, Copperfield called Epstein quite frequently and left messages that indicated they socialized together; (c) Copperfield himself has had similar allegations made against him by women claiming he sexually abused them; (d) one of Epstein's sexual assault victims also alleged that Copperfield had touched her in an improper sexual way while she was at Epstein's house. Based on this information, I believed that Copperfield might have relevant information to provide in the cases against Jeffrey Epstein and accordingly provided notice of a possible deposition.

18. Epstein alleges that there was something improper in the fact that I identified Bill Richardson as a possible witness against him in the civil cases. Richardson was properly identified as a possible witness because Epstein's personal pilot testified to Richardson joining Epstein at Epstein's New Mexico Ranch. See deposition of Larry Morrison, October 6, 2009, at 167-169. There was information indicating that Epstein had young girls at his ranch which, given the circumstances of the case, raised the reasonable inference he was sexually abusing these girls since he had regularly and frequently abused girls in West Palm Beach and elsewhere. Richardson had also returned campaign donations that were given to him by Epstein, indicating that he believed that there was something about Epstein that he did not want to be associated with. Richardson was not called to testify nor was he ever subpoenaed to testify.

19. Epstein alleges that discovery of plane and pilot logs was improper during discovery in the civil cases against him. Discovery of these subjects was clearly proper and

necessary because: (a) Jane Doe filed a federal RICO claim against Epstein that was an active claim through much of the litigation. The RICO claim alleged that Epstein ran an expansive criminal enterprise that involved and depended upon his plane travel. Although Judge Marra dismissed the RICO claim at some point in the federal litigation, the legal team representing my clients intended to pursue an appeal of that dismissal. Moreover, all of the subjects mentioned in the RICO claim remained relevant to other aspects of Jane Doe's claims against Epstein, including in particular her claim for punitive damages; (b) Jane Doe also filed and was proceeding to trial on a federal claim under 18 U.S.C. § 2255. Section 2255 is a federal statute which (unlike other state statutes) guaranteed a minimum level of recovery for Jane Doe. Proceeding under the statute, however, required a "federal nexus" to the sexual assaults. Jane Doe had two grounds on which to argue that such a nexus existed to her abuse by Epstein: first, his use of the telephone to arrange for girls to be abused; and, second, his travel on planes in interstate commerce. During the course of the litigation, I anticipated that Epstein would argue that Jane Doe's proof of the federal nexus was inadequate. These fears were realized when Epstein filed a summary judgment motion raising this argument. In respo-nse, the other attorneys and I representing Jane Doe used the flight log evidence to respond to Epstein's summary judgment motion, explaining that the flight logs demonstrated that Epstein had traveled in interstate commerce for the purpose of facilitating his sexual assaults. Because Epstein chose to settle the case before trial, Judge Marra did not rule on the summary judgment motion. (c) Jane Doe No. 102's complaint outlined Epstein's daily sexual exploitation and abuse of underage minors as young as 12 years old and alleged that he used his plane to transport underage females to be sexually abused by him and his friends. The flight logs accordingly might have information about either additional girls who were victims of Epstein's abuse or friends of Epstein who may have witnessed or even participated in the abuse. Based on this information, I believed that the flight logs and related information was relevant information to prove the cases against Jeffrey Epstein and accordingly I pursued them in discovery.

20. In approximately November 2009, the existence of Scott Rothstein's Ponzi scheme became public knowledge. It was at that time that I, along with many other reputable attorneys at RRA, first became aware of Rothstein criminal scheme. At that time, I left RRA with several other RRA attorneys to form the law firm of Farmer Jaffe Weissing Edwards Fistos and Lehrman ("Farmer Jaffe"). I was thus with RRA for less than one year.

21. In July 2010, along with other attorneys at Farmer Jaffe and Professor Cassell, I reached favorable settlement terms for my three clients [redacted], [redacted], and Jane Doe in their lawsuits against Epstein.

22. On July 20, 2010, I received a letter from the U.S. Attorney's Office for the Southern District of Florida – the office responsible for prosecuting Rothstein's Ponzi scheme. The letter indicated that law enforcement agencies had determined that I was "a victim (or potential victim)" of Scott Rothstein's federal crimes. The letter informed me of my rights as a victim of Rothstein's federal crimes and promised to keep me informed about

subsequent developments in his prosecution. A copy of this letter is attached to this Affidavit. (A copy of the letter is attached to Statement of Undisputed Facts as Exhibit UU)

23. Jeffrey Epstein also filed a complaint with the Florida Bar against me. His complaint alleged that I had been involved in Rothstein's scheme and had thereby violated various rules of professional responsibility. The Florida Bar investigated and dismissed the complaint.

24. I have reviewed the Statement of Undisputed Facts filed contemporaneously with this Affidavit. Each of the assertions concerning what I learned, what I did, and the good faith beliefs formed by me in the course of my prosecutions of claims against Jeffrey Epstein as contained in the Statement of Undisputed Facts is true, and the foundations set out as support for my beliefs are true and correct to the best of my knowledge.

25. All actions taken by me in the course of my prosecution of claims against Jeffrey Epstein were based upon a good faith belief that they were reasonable, necessary, and ethically proper to fulfill my obligation to zealously represent the interests of my clients.

I declare under penalty of perjury that the foregoing is true and correct.

Dated: 9/21, 2010

Bradley J. Edwards, Esq.

THE NEARNESS OF GRACE

A PERSONAL SCIENCE OF SPIRITUAL TRANSFORMATION

Arnold J. Mandell

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Appreciation is expressed to the Fetzer Institute for their support of this work. Particular thanks are due their imaginative Vice President, Dr. Paul Gailey, who shared my vision and hope that these somewhat disparate themes could be blended into a meaningful whole. Time and the reading by others will tell whether this idea was realized. The Fetzer Foundation and Dr. Gailey have facilitated exploration into blends of science and spirituality, particularly in the context of personal meaning. They also have a history of supporting serious work in this era's most powerful and rigorous exercise in holism as represented by the mathematical and applied mathematical fields of modern dynamical systems theory. Fetzer's very special environment and years of dedication have encouraged the variety of personal meanings within science to emerge and be recognized as legitimate and important parts of the research enterprise. It would be difficult to imagine a more propitious context for this effort.

The book is dedicated to my daughter Buna, and to my intellectual and creative companion, Dr. Karen Selz, whose deep and lovely mind wrote much more of this book than is formally acknowledged.

CHAPTER 1:

IN SEARCH OF THE MIRACULOUS

More than a half-century of naïve persistence and driven search for unity in the biophysics of mind and personal spirituality as the basis for healing transformation has led me into many laboratories. The motivation may have been genetic. My father said that we were descended from several generations of Jewish mystics, none of them able to attain the salaried status of rabbi or cantor. These ecstatic men lived lives of peripatetic eccentricity, stirring congregations with provocative insights and uncomfortably personal inquiry. But only for a little while. Soon they were asked to leave the synagogue and often their Eastern European Jewish townships called shtetels as well.

My father, in the first generation of our family without rabbis in over a Century, was a businessman-musician, who in the early mornings studied Talmudic commentaries. He taught me about why it was that most interpretations of the book by the rational, physician, lawyer, philosopher, Moses Maimonides, called *Guide for the Perplexed*, were in error in their assumption that man *cannot* understand God's nature with his mind. He took issue with the opinion that the union of a person's intellect and Spirit with Him was not possible as long as a person was living. Ibn Tibbon, Maimonides' best-known early translator and interpreter, relegated the cognitive, analytical, physical and alchemical transformational sciences to the earthly, not spiritual realm. My father disagreed. He espoused the work of the 13th

Century proponent of a school of Jewish ecstatic mysticism, Abraham Abulafia, whose interpretation of the *Guide* and his own *Commentary on the Secrets* taught that the human mind, *if transformed into a "state of active intellect,"* could become one with Spirit, realizing the Kingdom of God in rational mystical experience in a state of excitement with new ideas. The new consciousness achieves deep knowledge of both the "upper" and "lower" realms of what he called "reality" both spontaneously and directly. He said that without personal transformation, this knowing is not possible.

Abulafia's lesson was that the mundane intellect of man has the potential for transformation into another kind of mind in a spiritualization of thought. This occurs via developmental stages that begin with intellect and imagination and culminate in what he called prophetic emanations. The exercises leading to this transformation are to be strongly willed and practiced with regularity. This work results in ascension to an ecstatic state accompanied by great intuitive powers, which Abulafia called "prophesy." Ibn Adret, the Chief Rabbi of Spain at the end of the Thirteenth Century, banished Abulafia from the Country, a Century before the Spanish Inquisition ousted all the Jews.

Following what my father said was required in the practice of *Kabbalah*, a 13th Century tradition of esoteric and mystical interpretations of the Scriptures, I learned the secret meanings of each of the twenty-two letter Hebrew alphabet. Much like the Platonic view of mathematics, that it existed before the physical universe, these symbolic equivalences were believed to be eternal in the transcendental realm. One of the rare written accounts of this oral tradition is in the thirteenth-century Hebrew *Book of Splendor* called the *Zohar* which describes the Hebrew alphabet as the heavenly code of the cosmos.

I learned that the *Tegragrammaton's* repeated letter *Hei*, being fifth in the Hebrew alphabet, represents the number five. In the Kabbalistic tradition, *Hei* implicates the functional five-partition of the human inner self or soul. The five parts are: *nefesh*, instinctual drives; *ruach*, mood, affect and emotions; *neshamah*, cognitive activities of the mind; *chayah*, efforts to understand and attain transcendence; *yechidah*, experiencing the world as a cosmic unity. Later in life as a psychoanalytical neuroscientist with a computational bent, the partitions divided thoughtful, forewarning forebrain from automatic and stereotyped hind brain, the signal analyzing thalamocortical system from the emotional and impulsive brain stem-limbic, the symbolically logical left from intuitively geometric right hemispheres. We divide the neurotransmitter moods of dopamine aggression from the transcendentally erotic serotonin and the organized dynamical states of periodicity and quasi(multi)periodicity from the real world complexity of chaos. I learned that it is comforting to divide an unknown whole into two or more unknowable parts.

The Jewish guru and Hebraic tutor of my childhood, Rabbi Isadore Kliegfeld, smiled when I told him about my sudden loss of panic during nighttime Hebrew letter meditations. He said that I had had received personal evidence that these powerful symbols could call forth the transformational powers of God. He said that I had been given a blessing, in Yiddish, a *nachas.* Maybe panic is not that far from the transcendence of an activated mind.

In my tenth summer, behind closed door in a hot back bedroom, first by accidental touch and then by more systematic chaffing, I evoked a pleasurably urgent and yawning feeling that began in the lower part of my abdomen and back. It filled me with thought emptying fullness that a sudden involuntary burst of pelvic contractions found resolution in an hour or two of an unexplainable sadness. I had been struggling to understand my father's well warn copy of William James's *Varieties of Religious Experience* and I wondered if I had been visited by one of the altered states he described. Was this what he meant by a transformative experience? A few months later, a late night meditation produced physical evidence, a thick, sticky, salty sweet stuff that by morning stuck my sheets together. Later that year, in my father's library, I found a translation of the 1500 BCE *Egyptian Book of the Dead*. It contained a creation myth of two Gods in which "rubbing with my fist, my heart came into my mouth and I spat forth Shu and Tefnut." Psalm 23, read rather regularly in Sunday school, began to make me wonder about the meanings of"…rod and staff that comforts…" and what was meant by "…my cup runneth over." Among the ten regions of the *Zohar*, connecting the inner world of man to the upper world, is the tree of ten *sefirot* in which *Yesod* , the phallus, occupies a central place. Now we're allowed to know that G-spot stimulation of the para-urethral glands in the female can result in spurt as well as a cup that runneth over.

Other occasions of the temporal disappearance of the self-conscious I occurred while doing the theorem and proof work of high school geometry. Axioms and the rule bound processes of deduction created difficult journeys from that which was given to what should be found. Rocking back and forth in a desk chair for hours, chewing on fingernails, cuticles and pencil ends, time disappeared in a none self aware state of work-a-day well-being. Sri Aurobindo's *Bhagadvad Gita* described this state as one of the rewards of *karma yoga*. Abulafia's Kabalistic School emphasized the importance of *hitbodedut*, detachment and seclusion in concentrated thought, as a technique for the attainment of spiritual "intensification." Stacks of lined yellow paper piled up full of blind alleys as I lived in humbling dumbness. One of my teachers of mathematics described it as the working mathematician's dark night of the soul. A breakthrough to a route from premises to proof brought an expansive rush.

Engagement in a struggle to fuse two differing contextual worlds may be transporting. Geometric visions can be used to do imageless algebra in a brain state that feels like intuition. The brain does something like this: Let the number of a sequence of unit squares, each side of measuring 0 to 1, be the denominator of a series of fractions, say fifths. Now put five of these boxes in a row. Then the sequence of all possible fifths, 0/5,1/5, 2/5,..5/5, is inscribed by cutting the vertical sides of the five sequential squares with a diagonal from the lower left of the first one to the upper right corner of the last. This line cuts each sequential square's front boundary with vertical lengths, 0.0, 0.2, 0.4…1.0 in a series of decimal fractions equivalent to the sequence of all possible fifths, the proper fractions 1/5, 2/5…5/5. It was Abulafia's kabalistic belief that symbolic, (algebraic), operations in (geometric) spaces can unify the "upper" and "lower" worlds in the eternal tensions between the body and soul, the inner world and the cosmos, the conflict making the global system both sensitive and stable. The geometric-topological approach to modern dynamical system's theory describes a convolution of the expansive motions (as in the upper world) and contractive motions (as in the lower world) embedded naturally in the curved time and space geometries of what are called *hyperbolic spaces.* Each point in this space can be visualized as a little saddle in which orbital flows from pommel and back flow down to the seat, bringing points together in contracting motion, and flows away from seat down along the sides are expanding the distance between nearby points.. In the middle of the saddle, simultaneously expansive and contracting orbits demonstrate *hyperbolic stability* composed of intersecting destabilizing and stabilizing influences. Loss of this countervailing *hyperbolic dynamical stability* results in global system transformations called *bifurcations* and/or *phase transitions*.

Transformation as a loss of stability is a theme of a recent poetic translation of portions of the *Zohar* called *Dreams of Being Eaten Alive* by David Rosenberg. He writes that at some time in the difficult journey through the often-incomprehensible *Zohar*, in order to gain entrance to the kabalistic cosmos, there arose what he called "heartbreak." "No matter how much intellectual study is involved, the reader cannot understand the text unless he or she has offered his heart to be broken on the altar of poetry…and prayer." Surrender may be the source of the strange, uplifting feeling of worked through dumbness.

My mother, once a conservatory teaching assistant in piano, sat beside me while I practiced almost daily, weekends included, from the age of two until the midteens. Her quiet analytic counter-point sounded mathematical, "You can hear that that this harmonic progression goes through intervals of fourths of dominant seventh chords." I felt the persistent lack of harmonic resolution as growing tension in my groin. "If you transform each of the 12 notes in a chromatic scale, multiplying it by five (in what mathematicians call) *mod 12* (the numbering system goes from one to twelve, not ten, before it repeats), one can recover the circle of fourths, the commonest harmonic chord progression in music." Though her computational talk supported rational thought, in my adolescent heat, the addition of Charley Parker's flatted fifth and ninth to the dominant seventh chord led suddenly somewhere else and she knew it. Hearing my arrangement of a Beethoven piano piece become a mix of classical and modern jazz themes that I called "How High the Moonlight Sonata," she laughed lasciviously as though tickled by this sensual violation of musical canon. A boogie-woogie Bach two and three-part invention brought more excited disapproval.

Mysterious are the conditions of attentive (preoccupied) and none attentive, (fugued out) disappearing time. I found a musical way for it to happen when improvising: continue to shuffle a small set of notes that stay within the melodic field of the tonal center of an unchanging tonic chord. In contrast, most melodies and their chords leave the tonal center to which they return in harmonic and melodic progression. We can call these conventional tonal centers *unstable fixed points*. They are *attractive repellers* of melodic and harmonic expectation. It has been mathematically proven that these hyperbolic systems are globally stable. In contrast, a melody that remains stuck in the tonic chord, a purely contracting *stable fixed point*, is technically a *chant*. Paradoxically, it can be shown that this kind of fixed point is globally unstable. Rigid things can more easily fracture. The rich, altered states of consciousness that emerge while hearing the beat of Tibetan monks meditating, the Sufi chant-dances of Rumi and the John Coltrane and McCoy Tyner's endless, single chord, tenor/piano dialogues exemplify the bifurcation to hallucinatory new stuff arising spontaneously from the experience of unchanging repetition. Constant repetition of the conditioned (expected) stimulus drove Pavlov's dogs, especially those with "nervous temperaments," into frozen, catatonic states. Abulafia's 1280 book on ecstatic techniques, *Hayyei Ha'Olam HaBa*, recommended the recitative rearranging of a finite set of Hebrew letters, frontward and backward, many times, using prayer melodies, until "...the heart will suddenly become aware of the intellectual, divine and prophetic..." and *hitbodedut* will rest upon him. The instructions were "...combine letters (and associated musical notes)... reversing and rolling them around rapidly until one's heart begins to feel warm."

It was in my freshman year at Stanford University when I met Michael Murphy, later to co-found Esalon, the California center for mystical pursuits and naked mud bathing. He is the author of *Golf in the Magic Kingdom* and with George

Leonard, *Integral Transformative Practice*. I watched him go through a dramatic personal transformation after participating in Professor of Asian Studies, Frederick Spiegelberg's seminar (with meditation lab) about Sri Arubindo's interpretation of the Hindu Bible, the Bhagavad-Gita. Shortly after the semester, he climbed into an abandoned tower on campus to continue his meditation. He remained there for several months, refusing to come down even after the Stanford Student Health Service sent a medical school psychiatrist to investigate. I was more than curious about how it was that this hard drinking, and like his brother Dennis, all night poker playing, Phi Gamma Delta party boy, had suddenly become a transcendent ascetic.

My girl friend Mary and I signed up for Spiegelberg's seminar in Indian Religions. We were made breathless by his accounts of administering a Rorschach Test to the Indian Saint, Swami Sivananda. He recounted discussions about God with the artists Paul Klee and Max Ernst and the philosophers Rudolph Otto, Paul Tillich, Martin Heidegger and Martin Buber. As homework, Mary and I practiced breathing awareness mediation twice a day. During the year, Spiegelberg sponsored a visit by the aging but still very lively Aldous Huxley to our seminar. He also brought us Alan Watts and several lecturers from the Jung Institute of San Francisco. Shortly after hearing Huxley talk about the spiritual power of a particular exercise of will and loving thoughts, Mary and I began the daily practice of *karessa*, some call it *coitus reservatus.* I was eighteen and she was nineteen. We found that withholding an orgasm in order to achieve *nirvanic extinction of all desires and passions* was difficult. We spent hours in karessa meditation, trying to experience the detachment described in the Bhagadvad Gita. This biblical explication of *karma yoga* told how it was that the warrior, Ardjuna, instructed by God Krishna in the form of his charioteer, was able to detach sufficiently to do his assigned job of killing without emotional involvement. Ken Wilbur, a modern, self proclaimed *pandit*, an academically oriented articulator and intellectual justifier of the dharma, the spiritual work of Hindu and Buddhist practice, contrasts the nirvana (literally "end") composed of emptiness in time and space, *dharma Kaya* in which "...no objects are arising..." with the lesson of the Bhagavad-Gita. Its message involved realizing ones spiritual unfolding within the stream of real time and space, finding emptiness in the world of form and inaction in the world of action.

We worked at karessa so ardently that there was barely enough time left to do our assignments in biology and chemistry. In a darkened room, Mary and I lay legs locked, lying on our sides, moving slowly and rhythmically, humming *Om* and waiting for our ascension. We worked at making the journey through Sri Aurobindo's soul planes of *higher mind*, *illumined mind*, *infinitive mind*, *over mind* and finally, the *supermind* of *infinitely empty no mind*. This somewhat unusual way to study for a three credit course in Asian Studies at Stanford grew naturally out of the central message of Spiegelberg's seminar that whereas "…deriving a universal theology is not possible, having the *universal experience* is required for an understanding of any of the world's theologies." The controversial Bishop of the Episcopal Diocese of Newark who teaches that Christian forms continue to evolve, John Shelby Spong, D.D. says, "…every biblical word represents an attempt on the part of our ancestors in faith to make sense out of a God experience *in their time and place. The experience …is eternal and real. The explanations will never be eternal and real. They will last only as long as the* (*cultural*) *mind-set that created them.*"

Mary got an A+ grade, topping Spiegelberg's class with a final examination essay, which, in literary detail, described her episodes of *samadhi,* yoga's state of unity with the creator. Her 25 page blue book contained accounts of walking fugues, spontaneously strong genital sensations, changes in tastes and smells, sudden feelings of rising spinal-abdominal kundalini, middle of the night dreams of oceanic orgasmic fusion with God. She failed to mention that she was describing her usual pre-menstrual state.

During these college years, I learned about two Isaac Newtons The first I met at elementary physics lectures; the unit was about how things worked called *mechanics.* Logically and computationally consistent but taken on faith, I learned about an invisible *field force* between masses called gravity that decayed in strength like the inverse of the square of their distances apart and operated in my intuitive world like an electromagnetic spirit. Less occult were the expressions of gravitational fields as *contact forces*, computed for the tension in the string of a pendulum or the pressure of the floor on a weight resting upon it. Faith in this realm came from exercises in physical object visualization followed by manipulation of self-consistent algebraic symbols. I learned about experiments attesting to the "reality" of these ghostly fields (that now include electric, magnetic and strong and weak nuclear forces), and yet it was the physicists that already believed them who designed the machines to demonstrate them. It was Gregory Bateson, Margaret Mead's houseboy, lover, photographer and social anthropologist who said, "Newton didn't discover gravity, he invented it."

One college summer I found a second Isaac Newton, perhaps not so estranged from the first. He appeared in the form of a marble bust in the chapel of Trinity College at Cambridge University, holding the prism he had used to explore the polychromatic properties of light like a talisman. In his essay called *Newton, the Man*, the early 20th Century Cambridge Don and economic theorist, John Maynard Keynes, said that the Newton of the chapel followed "…certain mystic clues which God had laid about the world to allow a sort of philosopher's treasure hunt to the esoteric brotherhood." Michael White's biography, called *Newton the Last Sorcerer*, described his work as an attempt to integrate the magic of the Old World with the science of the New Age. Newton's awe over what he saw as the wonders of the universe maintained him in private theological study throughout his life. Arthur Waite's *Alchemists Through the Ages* describes how Newton's alchemical orientation toward the earth's fundamental substances such as fire, air, wind and water, their powers and potential for transformation, was joined imperceptibly with his metaphysics and physics. In his hands, experimental observations involving gravitation, celestial mechanics and optics, though motivated by esoteric alchemical theories, generated experimentally accessible phenomena and testable ideas.

The French mathematician, Jacque Hadamard, in his *The Psychology of Invention in the Mathematical Field*, said that mystical preoccupations were never far from the minds of most of the English and European mathematicians and physicists of the 18th and 19th Centuries. This orientation served as an impetus for them to pay attention to the almost imperceptible whispers of their emergent thoughts. E.T. Bell, the historian of mathematics and mathematicians said even

Descartes, the essential Enlightenment rationalist, was responsive to his "…call of the Spirit…" Napier the inventor of logarithms wrote an exegetical commentary on the Book of Revelations. The mathematician and physicist, Pascal, believing that contact with a religious relic had cured his terminally ill sister, wrote long tracks about whether or not the Devil could work miracles. The great mathematician, Cauchy, was known for his persistent efforts to convert fellow mathematicians to Roman Catholicism. Gauss, who was not particularly religious, said that a difficult to prove theorem did not result from hard work but "…the grace of God." In letters between Liebniz, who along with Newton was the inventor of calculus, and a member of the family of great mathematicians, John Bernoulli, used scriptural quotations and biblical diagrams as part of their theoretical correspondence. Perhaps the greatest mathematician of the 18th Century (or ever), Euler, in his *Letters to a German Princess*, discussed the functional characteristics of spirits and the connections between body and soul. Bell said Euler "…never discarded a particle of his Calvinist faith."

It was to the working out of a law of mechanics called "the principle of least action" that Ernst Mach attributed the beginning of the separation of physical mechanics from formal theology. The flavor of this change is captured in his 1893 *The Science of Mechanics* that stimulated Bridgeman's 1936 more formal philosophical analyses of physical theory, from a position that came to be called operationalism: the restriction of physical concepts to those definable in terms of the experimental operations required to demonstrate or prove them. Mach said that these events marked the move of formal metaphysical thinking about mechanics and the physical sciences more generally into the personal and private realm of belief and meaning.

Maupertuis, an eccentric friend of Frederick the Great and president of the Berlin Academy, proposed the principle of least action as evidence of the infinite wisdom of the Creator. As an early psychopharmacologist, Maupertuis recommended the use of opium to facilitate creative thought and was famously parodied for doing so by Voltaire in his 1752 story in which he is portrayed as the naïvely foolish Dr. Akakia. The physical law of least action belongs to a set of ideas that are called *variational analysis.* They involve the natural (or miraculous) selection of maxima or minima in quantifiable physical processes. Of all possible two-dimensional shapes with the same perimeter, the circle contains the greatest area; in three dimensions, it's the sphere. In his *Principia*, Newton reports his work determining the optimal shape of round solids, with circles of revolution having the same effective cross section, in order to minimize frictional resistance to gravity in a medium.

The *principle of least action* says that imparting energy; say by a kick, to a physical body on a rigid two-dimensional surface like the earth, results in it taking the shortest route possible from its initial to final position. The related 1650 Fermat's "principle of least time" is about light. As Feynman explains in his *Lectures in Physics*, "...out of all possible paths that light might take from one point another, light takes the path that requires the shortest time." Feynman, using elementary relations from high school geometry, proved that the *least time principle* could lead directly to Snell's law of the refraction of light at the interface of two different conducting media such as air and water. His analogy was the optimal choice of the path to take in order to rescue a pretty girl drowning in the ocean. Whereas the shortest distance to the girl leads directly into the water, faster running along the beach to the point that minimizes the distance required for the intrinsically slower rate of swimming increases the distance traveled but reduces the time required to reach her.

Euler attributed the optimization principle to an expression of the meaning and purpose of a loving God. Infused with this spirit, he developed mathematical methods describing smooth variations in position of an object in motion, the Euler differential equation, in which differential coefficients are varied to prove the principle of least action for mechanical motion. He gave the law Maupertuis's name. Mach quoted Euler's conclusion, "As the construction of the universe is the most perfect possible, being the handiwork of an all-wise Maker, nothing can be met with in the world in which some maximal or minimal property is not displayed." Such faith based mathematical formalisms were rejected by Joseph Lagrange, an early 19th Century mathematician, who, among many other things, proved that every natural number could be expressed as the sum of at most four squared numbers. It was his strongly held opinion that metaphysical speculation was both foreign and inimical to the conduct of mathematics and science. His work in the *calculus of variations* led to the development of a system of algebraic manipulations seeking the value of constants, Lagrange multipliers, in place of solving Euler's differential equations. It makes it possible to immediately write down a computable expression for the maximum of a mathematical equation. The technique is now routinely taught to high school students and with no mention of the role of belief in the perfection of God in its discovery.

* * *

I was a fortunate freshman medical student. After a visit to his office and a stimulating discussion about some of the correspondences between the ideas of psychoanalysis and neurobiology, Robert Heath, Tulane Medical School's Gary Cooper-like charismatic chairman of the psychiatry department, offered me a place in his animal and human neurophysiological laboratory. Between classes, evenings and weekends, I used a Horsely-Clarke apparatus, one of the world's first stereotaxic devices. It allowed the precise placement of electrodes into functionally specific regions of a cat's brain. The electrodes were cemented to the skull in place and their wires connected to a device by which the frequency, amplitude and wave shape of the electrical stimulation could be oscilloscopically monitored and electronically controlled as the conscious cat walked around the room. I spent hours observing and recording changes in spontaneous behavior that followed activation of various nuclei in the cat's brain with small electrical currents.

Deep in the part of brain that resides in the upper neck, called the lower brain stem, the region thought to regulate functions such as breathing, heart rate, blood pressure, gastrointestinal motility and global states of consciousness such as wakefulness and sleep, I found stimulus sites that, after 15 seconds of electrical activation, led to several minutes of hissing and objectless rage. One cat attacked an empty chair. These regions when activated also inhibited spinal reflexes such as the knee jerk of the standard neurological examination. Such phenomena were already well known in the late 1930's in what W.R. Hess and later John Flynn, following electrical stimulation of cats in the lateral hypothalamus, called "hypothalamic rage." In the late 1940's and 1950's, work by National Institutes of Mental Health's Paul MacLean attributed it to the actions of parts of the emotional "limbic" brain, particularly the fear-rage-attack coloring of experience by the temporal lobe's amygdaloid nucleus. Modern imaging studies in man have shown that this source of emotional coloring is activated by new information, even before the more rational parts of the neocortical brain processes it. How we feel about something new arises before what we think about it. These survival-oriented states of fight or flight are known to be biologically universal and demonstrable in even single cell organisms.

A greater contribution to my brain metaphysics followed observations that after several seconds of stimulation of other brain stem sites, the cats became alert but quiet, staring into space for several minutes. Then, they circled slowly and curled up on the ground. This was followed by several minutes of grooming and loud purring. Difficult to handle cats became transiently tame, some coming close for petting. I found that these same sites also increased the amplitude and reduced the threshold for the cat's knee jerk reflex. Responsiveness increased with calmness. Particularly interesting was the finding that electrical induction of this purring state could immediately stop on-going stimulation-induced episodes of hissing rage. I referred to these experiments with my friends as my neurophysiological studies of Old Testament vengeance and New Testament forgiveness. It seemed that the hissing rage would produce eye for an eye and a tooth for a tooth hypertension, the talon principle of the Old Testament and Koran. New Testament forgiveness would yield low blood pressure health and Jesus was a healer. It was about this time in the early 1950's that Northwestern University social psychologist, Jim Olds, found that rats could be trained to push levers to obtain current delivery via electrodes in various parts of their brains. Shortly after, Joseph Brady, then of the Walter Reed Army Institute of Research, showed that squirrel monkeys would do the same. With depth electrodes attached to wires running to a miniaturized electronics box strapped to their belts, some of Robert Heath's schizophrenic patients spent hours pressing their switches with beatifically expectant smiles.

It was after several months of cat experiments that Professor Heath suggested that we spend some time interviewing a hospitalized, chronically ill female patient, Donna, before and during the time she was being studied with recording and stimulating depth electrodes in the human neurophysiology laboratory. Donna, bony thin in a lose fitting green hospital gown and sandals, had dark red toenails, blonde hair and eyes shadowed darkly. In her mid-thirties, she had never married and, when she could, worked as a beautician. She told us that since her menarche at 13, she increasingly often had episodes of spontaneous ecstatic rushes along with sudden visions of strong white light. She attributed these experiences to visitations of "...an unseen Christ." She showed me a stack of notebooks filled with hand written accounts of her religious experiences interspersed with biblical quotations and difficult to follow discussions of what she called the Christian ideals underlying the Civil War. She read parts of it to us. One of her memorable stories was about being invited to a Children's Crusade that had begun in Georgia, led by a great grandson of Stonewall Jackson. "We were trying to find the Lord to see if He would part the waters and open up an escape route from General Sherman's march to the sea."

From a relatively poor family of Southern Baptists in rural Louisiana, she had lived in a state psychiatric hospital for almost three years. Her diagnoses ranged from borderline schizophrenia to temporal lobe epilepsy. The collateral interviews with her mother from several years before had been placed in the hospital chart. They recounted that in the patient's middle to late teens she had become suddenly promiscuous, frequently approaching strange men in city parks. Obsessed with fellatio and swallowing sperm, she told her mother that she was receiving a holy sacrament. More recently, the increasing incidence of ecstatic episodes and compulsive note taking coincided with the complete loss of interest in sexuality in any form. Her talk was now full of moralizing detail about the shoulds and should nots of daily living. She referred to herself as a non-Catholic nun who was married to Christ. The brain waves recorded from electrodes deep in her brain demonstrated transient episodes of spiking in a midline limbic structure called the *septum* and in the right *hippocampus*, deep in the *temporal lobe*. Paul MacLean and others since have shown that electrical stimulation of these and related brain regions could produce pleasure and grooming reactions in cats and prolonged penile erections in squirrel monkeys.

Many years later, I spoke about Donna with the Harvard professor of neurology, Norman Geschwind. He took me to his twice a week epilepsy clinic. In an effort to demonstrate what is now known as the Geschwind Syndromes of between seizure, *inter-ictal personality changes* in patients with temporal lobe epilepsy, he stood in front of the patients' waiting room. In a loud voice, he asked that all people keeping diaries and personal notebooks please stand up. Several did so, some displaying their notebooks in outstretched hands. The pages that I saw were filled mostly with religious writing, biblical quotations and exclamation points. Gathering the positive responders together, he asked them in turn what religion they were. Several answered the question with the question, "When?" It turned out that many reported having several experiences of religious conversion. Geschwind called them "Jamesian Episodes" after William James' *Varieties of Religious Experience*. He then asked when was the last time they engaged in sexual activity. For most of them, including those that were married, it had been years. Thought the men said they were not impotent, experiencing early morning spontaneous erections, they claimed a complete loss of interest in sex though feeling warmly affectionate toward people generally. As he anticipated, the patients were emotionally intense and unstoppably loquacious, needing to speak at length about their moral philosophies. They persisted in following us around the clinic waiting room, several speaking at once. In his lectures and papers, Geschwind called this last feature, difficulty in separation, interpersonal "stickiness." First reported by the French electroencephalographer, Henri Gastaut, a history of multiple ecstatic religious experiences, increasing emotional intensity and lability, hyposexualilty (not impotence), moralizing religiosity, compulsive and frequently poetic writing and tendency to cling to people is now called the Geschwind Syndrome of temporal lobe epilepsy. Some say it is relevant to the likes of Apostle Paul, Sister Teresa and Joan of Arc.

One evening in the human neurophysiology laboratory, I was invited by Dr. Heath to join him and several other brain scientists behind a two-way mirror to watch an interview with Donna while electrical current was being put through her recording electrodes. We watched and listened as a psychiatrist interviewed her about her past. The patient was speaking about her childhood. Unseen by the patient, the neurophysiologist, with us behind the mirror, was intermittently pushing the button evoking brain stimulation with very low current applied to the septum. Dr. Heath told me to listen for subtle changes or discontinuities in the flow of the on-going conversation that he said might reflect alterations in her thoughts and feelings. .

"The first time we were allowed to take a break from Sunday school for the church service and I got to hear the choir and the pipe organ, I suddenly got a feeling of happiness that I hoped would last forever. My Sunday school teacher told us how much Jesus loved us and that's what the music made me feel like. For the first time in my life I felt completely safe." Though the two way mirror I saw the psychiatrist nod silently. "When I learned about the real meaning of Christmas and Easter, it was frightening and beautiful."

Within a few seconds after the neurophysiologist, behind the mirror and unseen by the patient or her interviewing physician, pushed the switch on the stimulus generator, the patient stopped talking. After a little more silence, her interviewer encouraged her to continue,

"You were talking about how beautiful the holidays were. Tell me in what ways?"

"I don't want to talk about that anymore." She blushed and looked very uncomfortable. The neurophysiologist's hand remained on the switch. She continued to speak with her psychiatrist.

"I have to ask you a favor and I don't know why. I hope you don't get upset. The thought won't leave me alone." She seemed embarrassed even as her body relaxed against the back of the chair languorously.

"Of course not, Donna. You know that with me you can say anything."

Her face reddening further, she stuttered something unintelligibly and then was silent.

"Pardon me, Donna, I didn't hear what you said."

"Would you mind if I rested my legs on your shoulders?"

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CHAPTER 2:

DOESN'T EVERYBODY

Varieties of religious experience and the potential they bring for personal change are embedded in and perturbative of our unique and common personalities. The *obsessive compulsive* may have an easier time with the rigid restrictions of Fundamentalism or be more resistant to the flagrancy of none rational mystical experience. The *hysteric* may find subjective evidence for the Holy Ghost more accessible and rules of behavior beside the point. The potential for double-jointed multiplicity in personal styles and quick transitions between them characterize what is called the *borderline personality*. It is in these ways that temporary and permanent brain styles in us and important others supply much of the ground for the possibility of spiritual transformation and the often attendant alterations in personality. How can we think about this facilitator and source of resistance to new spiritual practice?

A skinny, knobby kneed, small breasted, mousy haired, bright-eyed psychotherapy patient of mine at UCLA's Neuropsychiatric Institute Outpatient Clinic was among the highest priced Santa Monica call girls serving Beverly Hills. Answering my unaskable question about her thousand-dollar fee, she explained that she was living proof that, in her profession, what was more important than physical beauty was "griv sense." She explained that by her middle twenties, she had developed the ability to anticipate the most highly prized but often embarrassing-to-say longing for a particular sexual act without being asked. She told me that she had to "empty out my personal sex manual" to feel the cravings of her clients. What the *john* most wanted appeared suddenly in her mind in the form of a cartoon. A university criminologist later explained that the word "griv" was probably derived from what pick pockets call *grift sense*, the ability to intuit who was likely to have enough money in their billfold to justify the risk, even if they appeared in the worn clothes and dated cars of old money.

In his 1913 Dernieres Penses, Henri Poincare′, France's seminal theorist in nonlinear dynamical systems theory, described intuition as a mental faculty which allows us to "…immediately see the end from afar…" In the context of mathematical epistemology, the instantaneous images of a geometer contrast with the labored sequential logic of the mathematical analyst. Poincare′ claimed that inclinations toward one or the other of these two cognitive styles and their associated mathematical tools arise from different kinds of minds. He contrasted the 19th Century German mathematicians, Weierstrass, who he said reduced his general theory of functions to "…a prolongation of arithmetic…without a single (pictorial) figure in any of his books…" with Riemann who called geometry to his aid in describing functions. He created "…an image that no one can forget… once he understood it."

Experiencing the behavior of others, we create a set of anticipations about whom and how they are that align with parts of ourselves. Aware of one aspect of a person, we imagine the others. With a small amount of initial information, we connect the dots, fitting features we have seen and heard to personality configurations stored by informal category in our brain files. Our conclusions about them "being one of those" can both facilitate and impair our perceptions. Eastern metaphysicians, Western mystical religionists, socially liberal secular humanists, Shannon information theorists and today's students of dynamical systems in brain and behavior can, in different ways, make the case that the content of these stereotypes reflect a pattern of constraints, our personal limitations resulting from the rutted roads of worldly experiences. Baba Muktananda, the Hindi Saint from the

Indian village of Ganeshpuri, called them our *samsara.* These limit the formlessness of anticipation that underlies sensibility. Our s*amsara* reduces the uncertainty that could serve as grounds for new perceptions and understanding of others. Pre-emptive distortions reduce the bandwidth available for new information. They impair the range of empathic relations with others as well as ourselves. These restrictions in possibilities and choices are expressed in enduring patterns of behavior, thinking and feeling that mental health practitioners call *personality* and *character*. When confronted with these constrictions, the self justifying and diagnostically revealing thought about a feature of one's personality is, "…doesn't everybody? " This pride in our shape contrasts with the teachings about emptiness of one of Baba's favorite Indian holy men, Zipruanna, who sat all day, loin clothed naked in a garbage dump, instructing his students and followers about knowing and being nothing.

We quantitate deficiencies in formlessness using statistical measures of *entropy*. They characterize the system's behavior as a distance from the state of *highest entropy* also known as *maximal randomness*. Professor Karen Selz of Emory University did a study in which her human subjects, after taking a battery of personality inventories, were asked to remove as many dots as possible from a computer screen full of them in three minutes. They were to do so by left clicking on each of them with the mouse key. Two seconds after a dot was removed, it reappeared and became subject to removal again. As they went about the dot removal task and unbeknown to the subjects, the orbit inscribed by their dot removing mouse travels was recorded for later graphic representation and quantification. Most subjects with the usual broad mixture of personality traits inscribed a wide variety of orbital line styles: little wiggles, big wiggles, large and small loops, little smooth slides and big and little jumps. The counter-intuitive coupling of stylistic rigidity and whole system instability (as in non-hyperbolic fixed points described in the previous essay and below) is in evidence at the personality and graphical extremes of her subject group.

A fastidious, rigidly organized, severely *obsessive-compulsive* subject repeatedly removes the same dot, only occasionally moving to a neighboring one to do more repetitious left key mouse clicking. Very little of the large computer screen of possible mouse travels is occupied. All the action is centered on a small set of points. When such a *minimal entropy* person is injured and feeling helpless, their stuckness can grow bizarre. Ruminative fixation in self-critical and persecutory ideas extend into poisoned food anorexia, circular pacing, weight loss and middle-of-the-night, worried insomnia. Suffused with sin, they ask forgiveness for soiling the chair by their sitting in it or smelling up the room with their body odor.

At the *high entropic* extreme, the mouse orbits of the seductively dramatic, new reality-creating *hysteric* includes big jumps, disorganized whorls and large and small restless and short attention span scribbles that tend to fill up the entire screen. The fragility of fixation at this end manifests itself in breakdown into impulsively out-of-control and floridly dramatic displays. Their decrease in contact with reality precipitates social chaos around them. The Montreal behavioral neurologist, Pierre Flor-Henry, using electroencephalographic and psychological test data, described the difference between these two extreme forms of personality expressions as the overly dominant expressions of one or another of the *left obsessional* or *right hysteric hemispheric emotional styles*. As examples, Flor-Henry said that a left half brain depression feels like hopeless and agitated indecision and the depression of the right brain is an experience of emptiness like homesickness. Left-brain happiness is being exactly correct and right brain joy rushes like being especially chosen.

The church going obsessional resonates with the sermon of the punitive priest who invokes the tension and relief of sin and salvation. The practice can result in a life long addiction to the transient high of this temporary forgiveness. In other churches, the hysterical character gets spiritual respite in disassociative visitations of the Holy Ghost and attendant *signs and wonders*. At Wednesday night healing services, new hope arises from personal surrender in a floor hitting, backward collapse called *dying in the Lord*. Both of these antipodal personalities contrast with the more receptive state of *in-between entropy* (with enough entropy available to form messages) which predicts more flexibility and higher potential for undistorted information processing. Relatively style-less and ego-less people are more open to hearing a variety of Gods in themselves and others. High alertness without presupposition, ecstatically aware and selfless, it is God's gift realized, a joyfully awake and nonjudgmental empty state of transcendence. As we sit, we work at feeling this in the brain of the enigmatically smiling stone Buddha.

The externally inactive state of high internal activity, the Bhagavad-Gita's formlessness in the world of form, inaction in the world of action, has a natural mathematical representation in the simultaneously expanding and contracting motions of *hyperbolic dynamics* and its associated entropic descriptors. How can this kind of formlessness equip us for almost instantaneous knowing? In a resting state of *uniform hyperbolicity* that only looks like randomness, accurate impressions of others can arise quickly and from only a few data points of observation. In the late 1960's, University of California mathematician, Rufus Bowen, proved the now famous *shadow theorem.* This says that in dynamical states of *hyperbolicity*, directly observable on the screen in computer simulations, the first few points of the on-going wild dynamical dance that appears to jump randomly from here to there on the computer screen, counter-intuitively will quickly outline the entire skeleton of its future global shape, its geometry, though more time of observation is required to realize this structure in full detail. The contracting motions on the stable surface of action, called a *manifold,* "iron down" all the points onto the *unstable manifold* that serves to outline the shape of the *attractor* of all starting points. In such a system, observation of just the first few points outline the whole. Intuition, anticipatory knowing and that which some call prophesy, may be expressions of the hyperbolic brain's mind doing dynamical shadowing.

To review briefly, *hyperbolic brain flow* is made up of three decomposable components: (1) The apparently predictable one along the main road of the action, going straight ahead and round and round on a throughway called the *center manifold*—analogous perhaps to what might be a sequentially logical development; (2) Intersecting the center manifold transversally is a field of influence moving the action away from the center manifold with out-of-the-box motion, exploring side paths of unpredictably new, creative possibility called the *unstable manifold*, we might think about inspired risk-taking, impulsive associations in thought; (3) Another transversally intersecting field of influence, which conservatively, rationally, "irons down" the expansive flow back onto the road, the entire constrictive field called the *stable manifold.* This influence herds points into *shadowing* the main road of the dynamics, like the hair of the dog that stay close to the real body of the animal in motion. It is in this way that just a few often slightly off the mark points nonetheless shadow the real (called *fiduciary*) orbits of the attractor, outlining its global geometry with just a little information.

The intuitive reason *shadowing* works is built into these natural countervailing tendencies of *hyperbolic dynamics*, which on one hand tends to spread out nearby initial points and brings disparate others together. The latter inclination is the one that smoothes down the escaping points onto surfaces of actions that mathematicians call manifolds. However, the details of the orbital paths don't look that orderly due to the *mixing* of the sequence of points in hyperbolic motion. The mixing process on manifolds has been analogized to that of the bundled pink loops of the stretching (expanding) and folding (contracting) taffy puller at the carnival candy stand. The process gets sequences of small particles of candy out of sequential order while maintaining the taffy's overall geometrically ovoid shape. *Disorder is local* with the entropy being generated by the repeatedly *shuffling* of the line up of the original orbital sequence. This results in the impossibility of any point-to-point prediction for more than a few points even though the over all shape is maintained. Exactly what minute a habitually late sleeper awakes can't be predicted. On the other hand, the skeletal manifold of the global structure is entirely in evidence from almost the beginning. Late risers remain late risers even without a precise, minute-to-minute, predictable schedule.

It is also interesting that a uniformly hyperbolic dynamical system, unlike the *fixed-point attractors* of stylistic fixation, resist perturbation-induced changes in global dynamical form. In an apparent paradox worthy of metaphysical allusion, the dynamically hyperbolic kind of formlessness has *structural stability*. The global geometric predictability of this point-to-point, completely unpredictable system can be both the subject and object of Zen frustration and thoughtful meditation.

During weekly professorial rounds at Los Angeles's Neuropsychiatric Institute, I assigned a standard exercise for psychiatric residents on clinical rounds, which involved limiting their contact with a patient to five minutes. This was followed by detailed discussion of everything we'd seen and heard. I'd ask them to predict what we'd find in the many pages of personal interviews and nurses observations in the clinic chart. The student psychiatrists with the most street smarts, called *emotional intelligence* by Daniel Goleman, were particularly quick at shadowing and thus predicting the patient's global dynamical pattern.

Do personality patterns exist? Evidence from biometric studies of the hereditary aspects of personality style in animals and humans suggest that relatively few global component properties underlie a variety of complicated-looking manifestations of behavioral style. Primary colors are the source of all hues. Harvard psychologist, Jerome Hagen, has reviewed the history of this idea in his book, Galen's Prophecy. While there are differences among personality research programs, almost all rating scale and questionnaire-based studies result in clusters of traits that reflect statistically associated properties which when taken together are called *temperament*. This idea is close to what we mean by personality. These relatively few response clusters are given descriptive names such as *introversion*, *extroversion*, *neuroticism*, *impulsivity*, *sociability*, *task persistence* and *tolerance of ambiguity*. As defined by psychological inventories, studies of families show that these styles are heritable in the range of 60%.

Hans Eysenck, in over four decades of work and more than 5000 published papers from London's Maudsley Hospital, derived common global factors of personality using questionnaires. The best known was called the Eysenck Personality Inventory. His studies resulted in evidence for only a few fundamental behavioral axes, behavioral manifolds, which describe extremal properties of personality types analogous to stable and unstable manifolds: *introversion-extroversion*, *shyness-sociability*, *low and high activity level* and *emotional constriction versus impulsivity*.

To make the issue of personality as dynamical system more realistically complex, we can call on some examples of the rich history of behavioral genetic studies using animals such as the mouse. They can be selectively bred for underlying personality factors, such as dominance, fear, aggression or exploratory courage. Not surprisingly, social interactions, as configured by the mouse's own personality style, contributed significantly to their behavioral patterns. As an example, the C57BL strain of laboratory mouse has strong tendencies toward impulsively wild behavior. To be anthropocentric and using Hagen and Eysenck-like behavioral dimensions, we could describe the C57BL mouse as exhibiting high *psychotocism*, *P*, energetic sociability, high *energy*, *E*, and low emotionality, low *neuroticism*, *N*. The C57BL also loves alcohol and will dominate the low *E*, shy, low *P,* retiring, alcohol avoidant, high *N,* emotional, anxious, frequently defecating albino BALB strain of mouse when they are placed together for a limited time in a novel situation during the daylight hours. Over a more extended time, however, the BALB mouse comes to dominate the C57BL, beginning with attacks in the dark and finally as the persistent and patient survivor over days of aggressive fighting. BALB's low *E,* social fear eventually turns into rage and aggression. The C57BL is quick to mate and ejaculate but very slow to recover sexually, so that the less post-orgasmically refractory BALB also wins in long term sexual competition in a cage full of fecund females. Modern social psychological approaches to human personality are beginning to approach the interactions of genetic brain proclivities and collective social dynamics in this way.

Employing Eysenck categories of personality characteristics, similar results about style as influenced by genetic selection can be seen in humans. The correlations between factor scores based on B. Loehlen's studies using the California Personality Inventory in twins demonstrated as much as threefold higher correlations among identical twins for *extroversion* (*E*) and *neuroticism* (*N*) factors compared with matched fraternal twins. The primacy of some of the in-born biological roots of these personality styles is suggested by G. Methany's finding of higher correlations between identical as compared to fraternal twins when studied at the age of two months. The similarities in personality and temperament measures included *activity level*, *regularity*, *approach-withdrawal*, *intensity*, *persistence*, *distractibility* and *adaptability*.

More recent familial studies of the heritability of personality characteristics included *childhood shyness*, *neuroticism*, *depressive symptoms*, *aggressiveness*, *behavioral inhibition and anxiety*, *behavioral flexibility*, *narcissism*, *deviant motor activity levels*, *novelty seeking*, *harm avoidance* and *reward dependence*. These studies were conducted by R.R. Crowe, J.F. Rosenbaum, A. Methany, and J.L Robinson and indicated familial congruity of these characteristics among first and second degree relatives in the range of 40-50%. This level of heritability in genetically unrelated family members was found to be less than 20%.

Low entropy fixations of personality can also evolve developmentally. Experiments in young animals have shown that stress-induced high levels of adrenal hormones exaggerate the normal developmental process of trimming back unused neural connections, called *pruning*, the normally complexly over-grown *sprouting* pathways. The pruning actions of the *pituitary-adrenal stress hormones* come to dominate sprouting actions of *neural growth factors* and their protection of neuronal axonal branching and connections during development. The research program of Bruce McEwan of Rockefeller University and others document nerve cell loss resulting from the neurohormonal concomitants of stress. This reduction in neuronal connectivity and neuronal cell content has been conjectured to contribute to the *pathological simplification* of neuronal projections and neural network complexity, reducing information processing capabilities. The still intact machinery underlying the global patterns of neurological activity, such as those that underlie personality styles, is arranged around these pruned, unoccupiable holes of lost brain possibility. If this range of potential behavior is extremely reduced, the behavioral syndrome is often called a *personality disorder.* Those that have one are the predictable Johnny one notes of response to perturbation: thrash out, lie without reason, get drunk, binge on promiscuity, steal unneeded things from department stores, or withdraw into interpersonal isolation.

A more abstract and quantifiable way of representing the pathological simplification-induced emergence of low entropy, stereotypical personality style is inscribed on the head stone of the post-suicidal grave of Ludwig Boltzmann. This father of modern statistical physics expressed the idea in the form of a transformation: the (maximal) entropy, S, of a system is the *logarithm of the number,*Ω, *of its available ways of being*, (i.e., $S = \log \Omega$). That is, one way a reduction in the dynamical entropy of a system can occur is by reducing the number of its available states. As the repertoire of ways of personal responding, log Ω, is reduced, so is the brain system's entropy, S.

Reality constrained patterns of behavior, as in successfully adaptive personalities, lie in some optimal in-between place between the maximal and minimum measures of entropy. The dynamical state that is postulated to yield *in-between-valued entropies* is called *nonuniform hyperbolicity*. This is best seen when the values of the experimental observations are plotted in a two dimensional *phase space* with each point represented by two values: along the *x*-axis is plotted the value observed, along the *y*-axis is graphed the *change* in the value from the last observation. The signatory motions of these observations plotted in *phase space* are irregularly varying in rate of expansion (near by initial values are separating in time) and contraction (greatly differing initial values are coming together in time). Values are not fixed, rhythmically varying nor in random motion. These *nonuniformly hyperbolic motions* are seen in speeded up, talking head videos showing bursts of hand gestures and in normal neuronal activity. Silences have widely varying lengths and bursts of hand movements and neuronal discharges are irregular in duration and character. The statistical pattern of neuronal inter-burst intervals is not the convergent Gaussian distribution of I.Q. or heights but the nonconvergent, long tailed, Levy distribution of flood incidences and, according to Mandelbrot, stock market crashes.

The labored logic and inscrutably compact mathematical formalisms of the Nobel Prize winning physicist, Ilya Prigogine, and his Belgian school, explain the thermodynamics of these long lasting niches of restricted variation in our personal style as energy requiring *dissipative structures*. Compulsive nail biting, driven promiscuity, readiness to be suspicious are seen as a persistence of deviations from the maximum entropy of formless, flexible, receptive end states. The system is trapped in possibility reduced, *energy requiring*, *samsaric niches* of what Prigogine called *minimal entropy generation*. We unique and oddly shaped and entropy leaking balloons maintain our characteristic distortions through energy-requiring, persistent efforts at insufflation. The maintenance of neurotic defenses and eccentric habits can be fatiguing.

* * *

The children at Kids in Distress Residential and Day Care Center in Southeast Florida, called KIDS, tended to be small for their ages. As a psychiatric consultant to the Center, I often summarized an evaluation of both their physical and intellectual development as “delayed.” Looking like almost completely formed adult-like personalities, however, they were developmentally “advanced.” I heard in a child analytic seminar at the Psychoanalytic Institute of Southern California that traumatized children often hurry through the dangerous developmental ambiguity of openness and flexibility to the predictable, fixed attitudes and behavior of adults. It was common to find prematurely wise young children serving as parents in chaotically dysfunctional families. In residence at the Center, set free from their pathogenic homes by social workers and family law judges, these premature caregivers lost sleep worrying about who was taking up their obligations to the sisters and brothers left behind.

Trauma-induced possibility pruning was often obvious in the young refugees at Kids in Distress. Having been soaked in alcohol containing, nutritionally deficient, crack-laced amniotic fluid, young babies were then left in dirty cribs behind locked doors to cry themselves into exhausted despair. Their mothers were working the streets for drugs. The children that survived often demonstrate personality styles that are reduced in variety. They came to use a few, individualized, and stereotyped techniques for survival. Some children’s insulated detachment was hollowly disguised as interpersonal caring. Others used driven and rigid compulsion to maintain the appearance of conscientious good citizenship. For some children, paranoid thoughts were realistic expectations. .

Arriving at the Center I heard “Dr. Arnold! Dr. Arnold!” in high-pitched screams. Several children ran up to me at once, demanding to be held. Some leaped into my arms for a hug. Trying to get and hold their visual gaze was another matter. Their eyes darted back and forth across my face, not stopping at my eyes, as though checking for danger. It felt like a strange mix of physical clinging and interpersonal distantiation. Many articles in the International University Press's Psychoanalytic Studies of the Child book series, described these prematurely formed child personality types: the paranoid scouts, the detached *as if* children pretending to feel, the desperate to please obsessionals, the charismatically seductive hysterics and the unconscionable psychopaths.

Experiments simulating trauma and neglect in young animals also demonstrate acceleration in biobehavioral development. Possibilities, the number of available states, Ω, brain entropies as $S = \log \Omega$, become casualties of traumatic and neglected early life. Like one trick ponies, these abused and abandoned children take up singular patterns of behavior that seem to work and stick to them. One doesn't anticipate seeing such narrowly fixated personality patterns until late adolescence or adulthood. They appear at ages too young to qualify for the character pathology coding of the Diagnostic and Statistical Manual IV. Yet the labels of adult personality disorder seem inescapable when one sees a four-year-old child trapped in a compulsive hand washing ritual or a panty flashing five-year-old girl with a seductive gait.

Four-year-old Alicia rubbed the lumps in my right hip pocket containing caramel candies. Her blue eyes twinkled. Her long blonde hair was in bangs and her lips in a pout. She kept a hand on her hip and tilted her pelvis as she spoke. Listening to children's stories, she straddled the reader's thigh and rocked. Alicia had a history of sexual abuse in a home that was a hang out for drug dealers. There were rumors that she talked to strange men late at night on the phone. On admission to the Center, she was found to have genital herpes. Both of her parents had been in and out of prison for drug-related crimes. The Center's staff spoke of Alicia's seductive smiles, incessant demands, irritable complaints and tantrums. With the back of her hand held against her forehead, she said that it was too hot to pick up the toys she had scattered around the fenced yard. Ordered to comply, Alicia took three steps into Florida's summer heat and fainted. Each morning, she spent the better part of an hour in front of the mirror, trying on all four of her dresses and their scarf and belt accessories before choosing one for her appearance at the breakfast table.

Five-year-old Grace was a suspicious and dictatorial presence in the Center’s kindergarten class. Articulate and righteous, she confronted children and staff alike with evidence for the unfairness she found everywhere. In legalistic defense of her rights and sometimes those of her peers, she used her strong wide face, penetrating look and quick and observant mind aggressively. Her somewhat intimidated childcare worker maintained Grace's cornrowed hair with care. Sensitive to criticism and quick to anger, she competed with her teacher for control of the class. Her drug abusing young mother had escaped from her own mother’s authoritarian house, leaving six-month-old Grace in the care of her commanding grandmother, a matronly church elder. Recent studies by David Reiss and associates at George Washington University assessed psychosocial dynamics in genetically varied families. They found that genetic similarities amplified the expression of individual characteristics of interpersonal relating through what might be called *personality resonance*. Relatives often commented that Grace and her grandmother, being alike, deserved one another. Shortly after her fourth birthday Grace was removed from her grandmother's home while the circumstances surrounding the accidental scalding of the bottom half of her body in an overheated bath were being investigated. She began her first conversation with me, “Hey doctor baldy, why are your bottom teeth so crooked?”

Damon was darkly handsome, with teasing eyes and a gleaming smile. Talking to his legal guardian on the pay phone in the afternoon of his second day at KIDS, he was heard to be making charges of mistreatment by the staff. He asked his guardian, loud enough to be heard throughout the day room, “What does it take to get someone fired around here?” Six years old and abandoned by his mother at the age of three, Damon came to KIDS with a history of provoking administrative conflicts at several children’s shelters. His record showed that once he successfully used accusations of beatings to get a staff member fired employing charges that were later shown to have been fabricated. He argued persuasively, manufacturing events and quoting imaginary conversations with smooth confidence. He could change stories midstream without apparent loss of continuity or confidence. He learned the power of a claim of abuse, and used the threat of it to control his environment. Damon talked other children out of their candy allotments, cheated at games and stole clothes from other children's lockers.

Debbie, age eight, was the eldest of four children. Her mother was a street prostitute with an expensive drug habit. Debbie was thin, restless and worried. A self-appointed mother from the age of four, Debbie felt responsible for the care and feeding of her brother and two sisters. With a history of physical and sexual abuse by a series of her mother's boyfriend-pimps, Debbie spent most of her time cleaning and recleaning their small apartment and worrying about obtaining enough food for her brothers and sisters. Her mother was often gone for one or two days at a time, and food supplies were not dependable. On several occasions, Debbie was caught stealing food from all night grocers. The investigative social worker reported that Debbie had learned to sell oral sex to the men who loitered behind a neighborhood bar. She used the money to buy food. For several days after admission to the crisis home, Debbie was anxious and sleepless. She worried endlessly about the welfare of her sisters and brother despite reassurances that they were in caring foster homes. She checked on them as frequently as allowed by phone. In a playroom therapy session, wielding a rubber knife, she pointed to a scar on her left forearm and told a story about the time that she cut herself with a kitchen knife and fed her blood to her infant sister when there wasn't any food in the house. Debbie kept her room very tidy, did all her chores and sometimes those of other children. Even after several months in residence, always-busy Debbie didn't have even one close relationship with any of the other children or members of the staff.

Despite the superficial differences, there are subtle and pervasive similarities among the personality styles of Alicia, Grace, Damon and Debbie. Like overgrown and tasteless cabbages, pale and four feet across, growing from seeds over-treated with gibberellin or auxin plant hormones, the inner lives of these prematurely big little people are relatively empty of stable interpersonal objects. The pantheon of indwelling companions are either malignant, absent or both. There is a deficiency of internalized significant others with qualities we more healthy neurotics paste onto new faces which we then love and hate. Instead, every interpersonal arrangement is new, suspect and run on a cash-and-carry basis. We are made to feel like there are no seats for us inside of them. Even Debbie, with her history of selfless motherly devotion to her "children," felt like an empty husk, encased in the exoskeletal armor of compulsive correctness. With their inner life unpeopled, the best we on the outside can hope for is to be valuable to them as tools, like forks and chairs.

In new and potentially therapeutic settings, for example a genuinely loving foster family, these children manipulate, testing for the feared loss and abuse that first generated their detachment. They provoke the very mistrust they fear. The sexually exploited child is seductive. The physically abused child provokes attack. Personality constellations which can be adaptive, when narrowed and fixated, become impediments to new and reparative experience. It is in this way that personality disorders are self-maintaining.

An irony is that these interpersonally empty and rigid patterns in personality tend to occur in the most constitutionally robust of the abused and neglected children. They are those who have escaped early death from failure to thrive, severe neuropsychological impairment, chronic depression, severe social withdrawal or the pediatric psychotic disorders. The children with sufficient flexibility to adapt quickly and survive often settle into empty-centered rigid caricatures of adult personality styles.

Of course, well-defined and characteristic personality patterns do not require abandonment and abuse or the pathological simplification of traumatic deforestation of neuronal connectivities in order to emerge. Demanding social selection of particular personality proclivities that are competitively advantageous for highly sought positions also results in the appearance of well-defined personality styles. Common examples are the technical types, "techies," "nerds," whose work require long hours alone to master and execute, as in doing mathematical proofs, solving problems in theoretical physics, unraveling computer programming problems or writing highly technical tracks. These activities can be aided by the personality inclinations of shyness and distantiation, the experience of discomfort in social occasions along with a rich private fantasy life. Diagnostically oriented mental health professionals (and lonely mates) may label these interpersonally distant, engineering rocket science people, “high functioning” sufferers of *Asperger’s autistic spectrum disorder*. Things going on inside get most of the attention, having more impelling importance than those on the outside involving other people. A recent study by Cambridge University’s Autism Research Center compares the *empathizing* (*E*) versus *systemizing* (*S*) ability of normal controls and adults with Asperger Syndrome and find the quasi-autistic adults are *deficient in E* and *superior in S*. They call it the *E-S theory of autistic spectrum diseases*. Psychotherapists of these *autistic spectrum* personality types, patients who characteristically do not seek therapy but are forced into the office by marital or family conflict, speak of their long, patient and mighty struggles to make intimate contact with these clients. A more philosophical question involves issues of what are acceptable individual differences and why it is that these high functioning, highly paid and successful professionals have any diagnosis at all.

It is not surprising that the highest paid members of corporations producing technical products and services such as IBM and Oracle are those rare individuals in technical sales that are able to combine the skills and insights of introverted scientists and technicians with those of the gregariously successful salespersons. In business schools such a blend is seen in people who combine talents in both marketing and finance. In architecture this combination might take the form of a graphic-design artist with computational mechanical engineering skills. Recruiters know that it is difficult to find people for what is called *engineering sales*.

From all over the United States, professional instrumental musicians that began to experience severe technical difficulties that defied their teachers as well as more extended practice time came to see Chicago’s music guru, Carl Boardstadt. He was a nationally known consultant to classical and jazz professionals in the 1920’s and 30’s. His particular specialty involved those who had “hit the wall,” those whose progress toward advanced musical mastery and accession into the higher echelons of the business had been truncated. His recommendations were often eccentric indeed. For the wind musician with breadth control problems, it might be blowing uniform bubbles through a long tube held at increasing depths of a filled bathtub or feeling the seductively diaphragmatically oscillating belly of a taxi dancer. Pianists with speed problems worked at specially constructed up-side-down keyboards with the rationale being that finger lifting was more rate limiting than finger placing. He said that his most hopeless cases were those whose personalities didn't fit their choices of instrument, too often made by what position remained open in the high school band rather than following a personal interview. He claimed that trombonists should be sensually languorous; clarinetists, nervously impatient; double reed instrument players, obsessional and withdrawn; brass players, athletic and exhibitionistic.

* * *

As one of the team physicians of the San Diego Chargers in the years 1971-1975, I spent several days a week in their summer training camps, on the team plane to and from games, in the locker room and on the sidelines during games. I was involved particularly in player drafts. Unbeknown to candidate players and other teams, we used a system of what social scientists call *unobtrusive measures* of their personalities as part of their evaluations. College football players are sent questionnaires each year by professional teams asking about a variety of life events and attitudes including their goals for the future. Filled out by hand, they served as *repeated measure*, *handwriting samples*. Twenty years of them were available in the Charger's record room. Using 30 standard signs from the French graphology literature and three trained raters, we evaluated the hand writing characteristics of players, National Football League wide, who obtained and retained playing, not reserve, positions in the League for at least three years.

After studying handwriting profiles from close to a thousand established NFL players, and hundreds of hours of individual interviews of members of many teams, it became clear that, athletic abilities being equal, success was more likely when the player's personality type fit his football position. What amounts to a series of selective filters are operated by coaches, scouts and managers throughout the playing careers of these players in grammar schools, high schools, universities and, ultimately, the NFL draft. Choices obviously involved more than height, weight, time in the 40-yard dash and performance in motor coordination tasks. The players behavior, carefully studied on the field, in multiple camera angle game films, direct and collateral interviews and observations under game conditions constituted a high level of selective pressure that brought with it the emergence of characteristic personality types. Tens to hundreds of thousands of candidates are winnowed down to several hundred highly paid players in this selective process.

Distinctive personality patterns accompany success at a particular position. Structure loving, politically more conservative, choreographed in detail and repeatedly rehearsed, offensive players keep their lockers more organized and tidy. More rebellious, resentful of structure, politically more libertarian, thematically instructed but principally opportunistic, defensive players, particularly linemen and linebacker's lockers had messy lockers. Defensive team players were most often in trouble with the law. Offensive lineman including centers, guards, tackles and some tight ends tend to be patiently enduring and tenacious, their aggression taking the form of stubbornness. This contrasts with the temperamental explosiveness of the defensive line and linebackers. We could speak of the volubility of centers, the loyal and caring kindness of offensive tackles, the narcissistic exhibitionism of wide receivers, the murderous rage of the defensive end, the sullen and paranoid depressiveness of the defensive back, the joyfully impulsive unpredictability of broken field running backs and the good citizenship egolessness of the blocking fullback. Some quarterbacks lead and play fearlessly in a religious state of grace, some are members of the Fellowship of Christian Athletes. Others lead as fearlessly, but in the style of an unconscionably calm psychopathic bank robbing professional.

Influenced by our findings, the San Diego Chargers drafted the Hall of Fame quarterback and one time ABC Monday Night Football commentator, Dan Fouts. Skinny and hurt several times during his college years as a quarterback in Oregon, he was passed over in the NFL draft until the third round. The scouts "knock" on him was that they thought that he lacked psychological and physical toughness; the ability to get up after a hit and to ignore the on coming tons of defensive linemen while calmly and quickly surveying the routes of several potential receivers. The pattern found in his handwriting features, however, resembled those Johnnie Unitas, the Hall of Fame quarterback of the Baltimore (then) Colts who, in spite of his small size, famously played with great courage and physical toughness. In chronic and severe back pain, he played regularly until retirement in his early 40's. Fouts drafted in the third round with a small five-figure bonus, proved to be a great bargain for the Charger franchise.

Given the theoretically infinite number of ways that a personality can be, it is remarkable that the latest Diagnostic and Statistical Manual of the American Psychiatric Association, DMS-IV, describes only eight types, which form three subsets of exaggerated expressions of stable personality styles called personality disorders. All eight personality disorders can be grouped into: (1) *Cluster A - Odd and eccentric types*, whose anxiety is related to the felt threat of disintegration and annihilation of the self and whose style is dominated by mistrustful paranoia, a schizoid, detached and emotionally flat pattern or the isolated strange eccentricism of *schizotypal characters*; (2) *Cluster B - Unstable and impulsive types* whose anxiety is related to loss of the stable self and whose style is dominated by irresponsible antisocial behavior, chronic instability with high amplitude fluctuations in behavior called *borderline*, or patterns of excessive emotionality and dramatic display associated with *histrionic characters*; and (3) *Cluster C - Fearful types* whose anxiety is related to hypersensitivity to criticism, guilt and feelings of inadequacy or loss of control, and whose style is dominated by interpersonal avoidance, clinging dependency, or rigid lock up into obsessive-compulsive efforts to do the right thing and avoid disapproval. This remarkably small array of stylistically consistent global behaviors selected from a practically infinite number of imaginable possibilities establishes a small set of invariants of some, perhaps abstract, property. These characteristic patterns inspire our search for the implied brain and behavioral conservation laws that may underlie them.

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CHAPTER 3:

TRANSMOGRIFICATIONS OF ENERGIES

After several of months of running, 12 miles most days, I felt an energetically calm, self-containment and a growing loss of interest in things sexual. My increasingly impoverished fantasy life led my training psychoanalyst to suggest that I was running away from the critical, females issues of my psychoanalysis. He said I was becoming more out of reach as I became more socially pleasant. This was decades before Prozac, Paxil and other serotonin reuptake inhibitors were inducing similar hyposexual, withdrawn states of cordiality in millions of Americans. Recall that Norman Geschwind, the Harvard Professor of Neurology, reported similar conditions of high energy sexual disinterest and abstract metaphysical preoccupation in patients with right temporal lobe epilepsy. For reasons other than the loss of church property rights and the spread of syphilis to the clergy, it felt like I was being readied for Pope Gregory VII's Eleventh Century celibacy reforms for abbots and clerics of the Catholic Church.

It was true that my feelings of dependence on my analyst for understanding and approval were being reduced as I ran into less emotional involvement. I was becoming a more rationally objective observer of others and myself. It wasn't the first time that my over-ardent practice led to this warning. Baba Muktanada, my Hindi guru, told me to reduce my daily sitting time of meditation. He said my spacey social smile belied a growing disinterest in the welfare of others. I was getting hooked on the hard training high of not really being there for other people.

Several articles in *Runner's World* said that many runners become addicted after even a few months of running over six miles per day. It's true that over fifteen years I missed less than 10 days of running per year. I ran in driving rain, sweltering heat and dangerous places. In New York's Central Park after dark, I followed a freshly strewn trail of torn woman's garments that ended in shredded panties and a bra on the Park's bridle path. In Oklahoma City at 104,° I was chased and bitten by a terrier. In Munich at 4:30 AM, before delivering a morning lecture, the black uniformed police stopped me for a shakedown. In Ann Arbor, I shuffled along in two feet of snow. By the Seine, at 14°, paranoid barge hounds barked in big dog baritones. I ran on the Hebrew University track a block away from a loud Palestinian bomb left in a refrigerator near a busy street corner. Breathless at nine thousand feet in Aspen, gagging on the strong manure smell of Sacramento Valley farms, in the hot wetness of Houston and dry heat of Palm Springs. I wore out three to four pairs of Nike running shoes per year. What I did not tell my training analyst was that this felt like a chase after God. As in most spiritual transformations, His messages and music could emerge quite suddenly.

Even after stretching, it was painful to begin and that was my daily sacrifice. I was readying myself to follow the God of the Hebrews and make the "three days journey into the desert" as in Exodus and Paul's recommended presentation of my body "as a living sacrifice, holy and well pleasing to God." After three miles of running, the hip pain, back stiffness and leg heaviness lifted, difficult breathing became easier. A burst of new energy appeared suddenly. The first pop usually took the form of assertive feelings fueled by new personal power, an undoing of the lethargy and depression of a helpless sinner. New and big, I felt like I could fix almost anything. Up bubbled an aggressive speech to the Dean about his refusal of our recent request for an increase in departmental research space. As for the National Institute of Health's recent return of one of our grant proposals, it was now clear that the reviewers were wrong. I would resubmit but this time ask for twice the amount of money. I rehearsed a new list of necessary and routine laboratory chores for my most rebellious post-doctoral student. I would tell my teen-age son that he must wait another year for his own car. I felt generally intolerant.

In an article in *Runners World,* I labeled my run's first *global brain state transition*, the *first second wind.* It energized me with the cool firmness but ready-to-be angry righteousness of modern religious orthodoxy: Orthodox Jews gunning down Hamas terrorists as retribution for bus bombing children which was itself a retribution; Muslim suicide bombing as vengeance for cultural contamination; Catholic Bishops refusing the Eucharist to pro-choice politicians; Charismatic Christians gay bashing defense of the sanctity of marriage; Mohammed's early Sufi-like poetry of love turning into territorial aggression and Jew killing in his later years.

Once in while, unpredictably, past the first hour of running and after the first second wind, a fatigue easing second burst of energy followed the second stage of exhaustion. I called this running-induced, *second global brain state transition* to a softer loving energy, the *second second wind.* Colors became intense, clouds breathed and my body lightened. Running once again became easy. I was flooded with empathic and generous thoughts. I understood that the Dean was faced with too many space demands to satisfy; the grant reviewers' criticisms of the budget were meant to be constructive. I recalled that strong minded, rebellious post-doctoral students often made the most creative contributions to science. I realized that my son's urgent desire for his own car was a proposal in the direction of the independence that would be required of him the following year when he was going to be hundreds of miles away at a university. Filled with benign optimism, I felt the compassionate perspective afforded those with energy but without envy, anger or fear. William James, in *Varieties of Religious Experience*, A.C. Underwood's book, *Conversion, Christian and Non-Christian* and Gobi Krishna's *The Awakening of the Kundalini*, among many others before and since, describe the sudden appearance of long lasting states of optimistic energy and loving empathy that can emerge after long episodes of suffering, especially following periods of privation of spiritual meaning and the loss of a previously strong faith. These episodes are painfully chronicled by St. John of the Cross in his *Dark Night of the Soul.*

In the long distance running model of spiritual transformation, the first energy appears suddenly in the middle of painful fatigue and feels like a vigorous implementation of Halachic commands or Canon Law. The second burst of energy emerges from readiness for resignation and ends in humane comprehension and empathy. In some Christian monastic practice, a similar transition is represented in the ritual of *Tenebrae* (or *Darkness*). Fifteen lit, unbleached candles are extinguished, one by one over the night, while reading the Psalms. The practice is said to represent the desertion of Christ by his disciples, as the church grows darker over the night. After the singing of the *Benedictus,* the one remaining light is quenched, plunging the church into total darkness. In *Myth and Ritual in Christianity*, Alan Watts suggests that the loss of the last light of *Tenebrae* induces the realization that “I am nothing.” This reduction in egocentrism, along with a dark-piercing alertness is said to facilitate an invasion by a loving God that precipitates the fasting, sleep deprived and praying petitioners into long lasting ecstatic states.

These uses of *energy* and its attendant characteristics are not physically specifiable but rather hermeneutic of a force. It is both a potential and a realization, observed and inferred. It is the “energy stuff” of Freud’s *libido*, Wilhelm Reich’s *orgone energy*, Pavlov’s *drive*, Rudolph Steiner’s *etheric formative force,* the *arousal* and *attention* of brain wave and consciousness research, the *Ch’I* of Chinese medicine, the Hindu divine energy of *Shakti*, the Hebraic *ruach*, the Cabalist’s *Yesod*, the Sufi’s *Baraka*, the Christian *Holy Spirit*, the Yogic breath energy, *prana*, Mesmer’s *animal magnetism*, Galvani’s *life force*, Goethe’s *Gestaltung*, Madam Blavatsky’s *astral light*, Georg Groddeck’s *it*, Henri Bergson’s *elan vitale,* Schroedinger’s *entropy*, Abraham Maslow, Ruth Benedict and Buckminister Fuller’s *synergy*, Bertalanffy’s *anamorphosis*, Colin Wilson’s *x factor* and George De la Warr’s *biomagnetism.* Of course, by nationality, culture and field of study, there are many more examples, each locally defined by its particular context and haunting with its promise of universality.

Energy in the context of mathematical physics is intuitional, abstract and relational. It is not created or destroyed, but rather transformed. Consistent with his deceptively simple style of physical intuition training of the young, Feynman’s discussion of *thermodynamic energy* and its *conservation* in *Lectures in Physics* begins with the premise that it is a numerical quantity that does not change when one or many alterations in the system occurs. His heurism for energy and its conservation involves the premise that Dennis the Menace has 28 indivisible blocks, a number which his parents find constant at the end of every day of play. If one day a count yielded 27, an investigation would reveal that a block could be found elsewhere, say under the rug. If at the end of the day, the count was 29, the extra one had to come from somewhere else, perhaps Dennis's playmate Bruce. If Dennis locked some of his blocks in the toy box and threw some into a bathtub of dirty water and (1) A block weighed three ounces; (2) The box alone weighed 16 ounces; and (3) Each block raised the water level of 6 inches by one fourth of an inch, then this metaphoric energy relation can be expressed:

$$\text{(blocks seen)} + \frac{\text{(weight of box)-16 ounces}}{\text{3 ounces}} + \frac{\text{(height of water)-six inches}}{\text{1/4 inch}} = \text{constant} \quad (28)$$

Feynman notes that this representation of an energy relation, computed as a number of blocks, will always remain the same. If there were no blocks in sight, and one used this *energy conservation relation* with blocks as units of energy, we find no blocks as such in the expression at all.

The abstract and formal idea of energy in physics first arose in mechanics and was generalized to electrostatics and electrodynamics. If one idealizes these systems, eliminating real world factors such as friction, temperature gradients, temperature dependence of the properties of materials, viscosity, hysteresis and other nonlinear behavior, then the energy conservation law says that in an *isolated and interacting* set of systems, the sum of the energies of the several systems remains constant. If, on the other hand, a system interacts with its surroundings, *not isolated and interacting*, then the increase in the energy of the index system is equal to the *work done* on the system by its surrounds. Like pre-Enron bookkeeping of corporate cash flow and balancing ones personal checking account, energy, like money, does not disappear; it is only changed in expression. As in the context of currency equivalent value, energy can represent a very general quantity applicable to a wide array of specific objects and activities. The results of the early studies by Professor Seymore Kety of Harvard and Dr. Harold Himwich of the Thudicum Laboratory in Galesberg, Illinois, using measures of *whole brain oxygen and glucose utilization* as indices of energy generation and utilization by the brain, surprised many of us. They indicated that energy use by the *whole brain* was relatively constant when states of relaxed awakeness, mathematical cognition and deep sleep were compared. Of course, modern studies have indicated that relative *regional* brain energy utilization is state dependent and may vary quite widely.

More spiritual aspects of energies and their transformations were made clearer during several month visits to Baba Muktananda's, now Gurumayi Chidvilasananda's, Sidha Yoga Ashrams. Baba Muktananda loved and worshipped his Hindu Guru, Bhagawan Nityananda. Baba had been a restlessly wandering, guru-hunting, young man. Nityananda said he had "wheels for feet." After many years of devoted meditation, chanting and service, *sadhanna*, all the while being prohibited from eating mangos, his favorite food, his passive, taciturn, ecstatic guru, Nityananda, presented voluble, energetic, joyful Baba with the guru's rather aromatic and worn sandals. This symbolically acknowledged Baba's successful absorption of the guru's transforming spiritual energy, *shaktipat*, the power of his enlightenment.

At Nityananda death, Baba, using world tours, spiritual fellowship meetings, *satsangs* (public conversations) and spiritual training sessions called "intensives", organized Ashrams in West Coast sites such as Oakland and Venice, and on the East Coast, in South Fallsburg, New York, buying several old residence hotels in the Borscht Belt. Baba was introduced to America by one of his first advance men, *Be Here Now* Baba Ram Das, Timothy Leary's co-investigator in the Harvard Student LSD project when his name was Richard Alpert. *EST*'s Werner Erhard was another of Baba's advance men.

Baba discipled and disciplined a sister and brother who, when 18 and 11 respectively, were sent to live in his Ashram in Ganeshpuri India by their parents. The girl was known as Malti when she served as a translator for Baba and Gurumayi Chidvilasananda after receiving the energy of her enlightenment. The younger brother was given the name of Baba's guru, Nityananda. When Baba took a guru's ecstatic death, *Samadhi*, both Gurumayi and young Nityananda became co-gurus. Following three years of the usual covert power struggles of succession in organizations, Gurumayi took over the guru lineage of Siddha Yoga. Her lively brother's worldly preoccupations with jazz drumming and confessions of promiscuity led to his giving up of the orange robe of the denunciate, *sanyasi*, for the blue robe of worldliness, exchanging one kind of energy for another.

Brad Gooch who visited Gurumayi's Ashram in Ganeshpuri, India, wrote in his recent book, *Godtalk*, that she looks like a "synthesis of Indira Gandhi and Bianca Jagger." In what reads like a Hunter Thompson episode in an unwritten book called *Fear and Loathing Along the Guru Trail*, *Godtalk's* explication of Siddha Yoga was dominated by yellow journalistic rumors such as the one about Baba's use of a gynecologist's table with stirrups for non-ejaculatory *Tantric practice* with some female followers. This unconfirmed claim remains, as Gooch says, in the realm of "...he said, she said." Gooch's exploration almost ignores the deeper meanings of *Kashmir Shavism*, *Buddhism* and *Kundalini Yoga* that compose the philosophical foundations of Siddha Yoga. The importance of knowing, loving and becoming one with the God within trivializes all but ungenerous or hurtful interpersonal behavior. Even the tougher version of the Ten Commandments in Leviticus 19 would not necessarily disagree.

When a Los Angeles Times reporter tried to chide Baba about being driven about in his "worldly" Mercedes sedan, he explained that a very wealthy Indian merchant had given it to him and "...I have to put my behind somewhere." Similarly, why would Gooch's account of Baba's Tantric practice, even if true, ruin the imago of him in my mind unless I had already surrendered to the pantheon of good and evil absolutes of Judeo-Christian taboo? My knowledge of these non-materialistic meanings of apparent materialism began with one of the favorite finds of Baba's youthful days of guru hunting: Zipruanna, who, wearing only a loincloth spent all day, every day, on a stool in the middle of a garbage dump. Remarkable changes occurred in people who spent time there in his presence. Baba said the identity of guru was established by the results experienced by those that spent time in his presence. It could not be defined by the physical features or ritual conduct of the interaction. People become spiritually energized and change in Zipruanna's smelly, garbage-filled presence. I keep a picture of him on my desk.

Gooch, in his implicitly and superficially righteous preoccupation with what he considered disenfranchising human vulnerability, recalls how the medieval church used the difficult to impossible vow of chastity for political control of their priesthood. He seemed to have missed Baba's lessons about the remarkably simple sounding practices for mobilizing the energy of the God-receptive state. Once in this new state, the rest of the metaphysical work almost takes care of itself. I, like many others, adopted Baba's mantra, *Om Namah Shivaya*, "I worship the God within me (and you)" that he was given by his guru. The inner chant of this mantra brings me to an internal quiet in which things become clearer. Meditation, chanting and service to the guru was motivated by his promise that my egoistic concerns ranging from the number of publications on my *curriculum vitae,* to the size and adroitness of my penis, would *disappear autonomously in the Baba state of bliss.* This sounds very much like the role of the transition to an "active intellect." in Abraham Abulafia's 13th Century *Commentary on the Secrets*. Arduous study of the spiritually dense writings of Sri Aurobindo during the days with Professor Spiegelberg at Stanford gave me a peak into the simple but difficult to execute idea of "simply" becoming the transcendently comprehending state of *existence-consciousness-bliss.*

Whereas Baba would occasionally lapse into terse Sanskrit verse and its multiplicity of potential meanings, Gurumayi keeps things simple. Sitting silently and immobile at *satsang* for hours, she radiates transformational energy, *shakti*, that makes ruminations about human affairs seem unimportant. The work is about getting the self concerned head noise of ones preoccupations sufficiently out of the way to allow the discovery of the God who has been waiting patiently within. A fellow ashramite gave me a photograph of my first audience with Gurymayi. It showed me on my knees in front of her. She appears to be dismissing me with a baleful, almost disdainful look as my introducer, gesturing broadly, was, unasked, reciting a list of my professional bona fides. The picture caught her waving me off with a long, peacock-feathered stick. Obviously unimpressed, she is sending me back to my all night, every night, tent cleaning labors at the Ashram. Rich Indian businessmen, whose large donations were a major source of support of the Ashrams, faired little better. They seldom received a personal audience or favorable seating at *Darshan*, the evening public time of question and answers with the guru. In contrast with the relatively easy public availability, mischievous play, provocative humor and worldly sophistication of Baba, the ambience of Gurumayi is more private, simple, serious and subtle. It is as powerful, but in another way.

In response to Gurumayi's ascension to Siddha Yoga's singular guru, I imagined hearing Baba saying that God energy was at least androgynous, if the dimension of sexual identity was relevant at all. Baba taught that *divine energy,* by necessity, is expressed through a wide variety of particular personalities and cultures and should not be confused with the details of its manifestations. This included the sexual identity of the chosen Vehicle. Guramayi's central theme, as I understand it, concerns the simple, quiet and pervasive powers of love and faith. Some say Baba took the path, *marga,* of selfless action, *karma-marga*, whereas Gurumayi took the *bhakti-marga,* the road of loving devotion and faith. The third *marga* is *jnana-marga*, my inclination, is the road of intellectual study and knowledge. Aldous Huxley related the choice among these three categories of *yoga* practice, to the physical and personality types of William Sheldon's 1954 *Atlas of Man. Karma yoga* corresponded to the *mesomorphic* body type and the assertive boldness, high energy, and interpersonal callousness of the *somatotonic* personality. *Bhakti Yoga* was the characteristic choice of *endomorphic* body types with the *viscerotonic* personality traits of sociability, good will, tolerance and love. Huxley associated *Jnana Yoga* with *ectomorphic* body type and the *cerebrotonic* characteristic of shyness, sensitivity and intellectuality.

My summers with Baba at his temporary Ashram in Venice, California and the permanent American Ashram in South Fallsburg, New York, were spent in daily, very early morning, chanting of the *gurugita* after most of the night spent taking down, cleaning and putting up large tarpaulin meeting tents. I was assigned this simple, arduously manual, all night work after being interviewed and found out to be a professor and chairperson of a medical school department. Baba instructed his assignment committee that many if not all professorial egos would benefit from what

Andrew Carnegie famously called the dignity of real work. Spicy one dish vegetarian meals, twice a day meditation and brief stolen naps consumed the rest of the day. I found myself meditating for longer and longer times, chasing the promised *Blue Pearl* that Baba said appeared behind the eyes near the supreme meditative end point.

Beside care with the titration of meditation-induced interpersonal disconnection, *detachment with love* is the desired end point of most Hindu and Buddhist meditative practice, another set of "side effects" of the energy arising early in the course of too much meditation is called *kriyas*, spontaneous episodes of involuntary behaviors and postures of the body such as unprovoked chanting and writhing and stereotyped hand positions called *mudras*. Baba told us one of his *kriyas* took the form of spontaneous erections that occurred during his first experiences with deep meditative states. I recall a woman physician and fellow ashramite in Los Angeles telling me that her panties often got so soaked during meditation that she worried about being stuck to her cushion. Beyond these initial somatic overflows of Divine Energy, *shakti*, emerges a vision of the *Blue Pearl*, *bindu*, Baba's "gift from the Goddess Kundalini." As he entered this stage, he said that his mind filled with "joyous contentment." Jewish mysticism of the 1300's acknowledged the neighborhood relations of Eros and the Sacred.

More formal and scientific uses of the word, *energy*, like all objects of thought embeddable in a mathematical context, are abstract and relational. In his book, *Mathematics-The Music of Reason, Jean Dieudonne′* treats *mathematical objects* as *objects of thought.* Dieudonne′'s book documents the 19th Century transition from concrete, visualizable, classical mathematics to abstract, nonvisualizable relational ideas. This conceptual transition to abstract, relational thought objects that are no longer representable by pictures or accessible to our senses of mathematics and physics is yet to reach the concrete DNA-causal religionists of modern molecular biology. In 20th Century mathematics, Dieudonne′ observes that "...the primary role in theory is played by the *relations* between mathematical objects concerned *rather than the nature of the objects themselves*...these relations are often the same for objects which appear to be very different and therefore they must be expressed in ways which do not take these appearances into account…and can be specialized at will…" DNA sequences are, as MIT molecular biologist, Eric Lander observed, nothing more than an elementary "…list of parts…" In fact, since about 1% of the nucleotides are relevant to functional genes, one might say that the important members of this list of parts are distributed very thinly among many more apparently unimportant ones. The next frontier will certainly involve an understanding of the dynamics of the interactions among elemental parts and in more abstract laws about molecular biological relations; a focus on the dynamics, not the structural parts, that regulate and control their expression.

* * *

I made a pilgrimage to spend eighteen months within Rene' Thom's penumbra, living among mathematicians in his "ashram" in Bures sur Y'vette, France. Thom was one of the founders of the *Institute des Hautes D'Etudes*, *IHES*, *Institute for Advanced Scientific Studies,* created to stanch the flow of high-level scientific talent away from France after the Second World War. It is in Bures sur Y'vette, deep in a green forested valley, 50 or so miles South of Paris, in a building packed with small, thin walled, big windows-on-the-woods offices. Each office contained a single hard chair, an old office desk, two walls of blackboards and a box of white only chalk. The use of colored chalk was felt to be without mathematical rigor because its use substitutes colors as dimensional descriptors for more demanding abstract and formal representations. Color was cheating. Meditation in this ashram was practiced by staring, pacing, scribbling, and humming, mumbling, belching and farting through the Institute's thin office walls. The building, though almost completely occupied, was otherwise silent. The Institute was populated by such world-class mathematicians and theoretical physicists that once inside that building, I felt so intimidated that I almost never spoke above a whisper. Listening to excellent William Thurston's casual use of a tiled bathroom floor to motivate a unique partition of a topological space, I was attacked by the awe of an early morning visit to an almost empty Notre Dame Cathedral in Paris or standing in front of Michelangelo's radiant marble statue of Mary and Jesus the Infant in the Vatican.

Though the environment was one of tranquil academic scholarship, I lived charged with anticipated performance anxiety about the seminars on *the brain as a dynamical system* I was scheduled to present to these (I feared) ready-to-be-disdainful, prize-winning, pure mathematicians and theoretical physicists.

My dorm-style sleeping room at *IHES* was, in winter, painfully cold and drafty; the narrow iron bed's thin mattress contained lumps of persistently disturbing dreams, the small scratched table for work shim-irreparably wobbled. A faded poster of Van Gogh's garden was tacked crookedly on the door facing the toilet in the dank, dimly lit small bathroom. A dwelling for distracted young mathematicians. A retired but still famous Parisian chef cooked many course, elegant meals every afternoon. The food was accompanied by so many liters of unlabeled red wine and peer pressure to be French and socially drink it that it became a choice between dulled, blunted,. sleepy post-prandial afternoons or living on bread, many cheeses, apples and Perrier water, alone in my room. I chose the latter.

Thom's gifts to us theoretically oriented non-mathematicians were diagrammatic, easy-to-visualize pictures that allow the intuitive capture of counter-intuitive discontinuities in functions. How we might imagine that a smooth and continuous change in a cause of something can lead to a big, discontinuous change in the results. His system of topological (shape not size) diagrams was useful when considering up to four causal variables and one to two dependent variables that described how things behaved.

For an important real life example, in modern clinical pharmacology, the smooth *dose-response curve* consistent with the physician's intuition that if a little drug didn't work, a little more may do so, should become an up and down search for the dose-region for the desired effect which may involve a lower amount than a previously ineffective drug dose. The therapeutic effect may occur in the middle of a narrow dose range with too much or no effect occurring out of this span. In many physical systems, sudden and global transitions in state, from incoherent light rays to coherent lasing and from laminar flow of fluids to turbulence, emerge unexpectedly when causal parameter are moved into what some call the *critical region of the values of control parameters.* Outside this region, cause and result were behaving linearly and smoothly whereas within this region we observe global and dramatic changes via a forced discontinuity in what Thom called a *catastrophe* and others use related words such as *bifurcation* or *phase transition*. The transitions from painful fatigue to running rage and then to ecstatic transcendence feels like the gifts from two kinds of Gods, the first, bearing the righteous lawfulness of the Old Testament, the second bringing the empathic forgiveness of the New Testament Jesus. Catastrophe and bifurcation theories predict and keep track of these transitions using mathematically describable changes in global characteristics of the "motion" using technical descriptors such as *eigenvalues*, *germs and jets*.

Thom taught me my first catastrophe, called the *cusp,* in words during our late afternoon walks along a shadowed green wooded path on the grounds of the Institute des Hautes Etudes, outside of Paris. My homework consisted of trying to visualize his verbal descriptions. It was not until weeks later that he drew the geometric object being discussed on the blackboard. With eyes twinkling and in his provocatively playful style, he said,

"Imagine an empty rectangular box with the front edge of its roof buckled into an `S' and the back edge, an unfolded, left-to-right gradually rising simple smooth curve. If one moves the causal force from low to high, from left to right along the back of the box, the changing effect (represented by height) would be smooth; moving from left to right in the front encounters a sudden drop off at the S shaped buckling, a discontinuity in roof height indicating a discontinuity in effect. The energy equivalent height of the roof graphically indicates the amount of result. The roof is the *manifold* upon which the result of causal change is portrayed. The two dimensional floor of the box represents a graph of the two causal parameters, the increasing amount of *normal factor* going left to right along the `x' dimension, the increasing amount of *splitting factor* (taking one from the back to the front to the region of the buckling) going back to front along the `y' dimension."

He gave me some examples of systems that showed cataclysmic changes in effect from smooth changes of *normal* and *splitting factors.* About the onset of a war: "At the back of the top surface of the box, the manifold, the *normal factor* increasing from left to right is the amount of the perceived threat. The *splitting factor* decreasing from front to back is the cost (and ability to pay) for war. Without the financial capacity to make war, threat goes from left to right smoothly at the back of the box as tension gradually increases without the onset of armed conflict. When effective fighting capacity is cheap and/or already well funded, the country well armed, the increases in threat go from left to right at the front edge of the box and encounter the cliff of catastrophe and war is declared. Cost of, or ability to wage war varies from the front to back, and serves as the *splitting factor.* Considering prison riots, social tension is the *normal factor* and alienation (degree of identification with prison authority) is the *splitting factor.*" Using factial expressions of dogs sketched by the Konrad Lorenz, Christopher Zeeman then of Warwick Mathematics Institute in England, considered countenances reflecting increasing rage as the normal factor, the amount of fear was the splitting factor. Increasing rage at high fear increased smoothly at the back of the box; at low fear, increasing rage falls off the cliff to an animal attack at the front of the box." He paced as he talked, occasionally looking up to see if I was following him. He continued,

"A light above the box casts a shadow from the roof to the floor, outlining the gradually widening fold created by the transition from the smoothly rising back of the roof to its `S-shaped' front. This triangle on the x-y causal floor is the region in which the discontinuity in the result surface roof results and is called the *bifurcation set.* An increasing amount of the causal `normal factor' is represented from left to right along the `x' dimension, the results of which change smoothly at the back of the roof but encounter a discontinuous jump up or fall down crossing the inaccessible crevice in the `S' fold at the front of the roof. Again, the triangular shadow on the floor made by the fold indicates the parameter region in which discontinuous changes in the result surface occur. The reason the parameter that determines the front to back location of the left to right movement of the `normal factor' is called the `splitting factor' becomes obvious. Its value determines whether the results induced by increasing amounts of `normal factor' will be smoothly changing or generate a discontinuous jump. The entire visualizable object is called a *cusp catastrophe* and it along with higher dimensional parameter region-inspired shapes such as the *swallowtail* and *butterfly* buy back the smooth *DE* deterministic intuition lost with discontinuous changes in results."

He grinned mischievously as he asked, "Can you see it?"

Thom's catastrophes serve as accessible and powerful theoretical settings for the use of *energy as a generalizable, one dimensional, dependent, resulting effect*, influenced by one or several, sometimes conflicting, independent, causal, variables. For more examples: the weight of a ship (smaller to greater, left to right, along the x, *normal dimension*) and the position of center of gravity (smaller to greater, front to back, along the y *splitting dimension*) are causal with a jump in roof-height *energy* from stability to capsizing, a discontinuity emerging from initially smooth changes in stability. As above, gradually increasing tension (the left to right *normal factor*) and alienation (the back to front (*splitting factor*) in inmates generate a sudden increment in *energy*, from subtlety increasing tension in relative quiet to the sudden outbreak in a riot in the prison population. Embryological *notochord somitogenesis*, (that which become the vertebrate of the spinal column) has a smooth (left to right) causal influence that Chris Zeeman named a *normal factor*. It is the smooth growth of the material wave of mesodermal (to become muscle, connective tissue and bone) tissue. Zeeman called the front to back dimensional gradient of influence, the secondary wave of adhesiveness, the *splitting factor*. The value of this secondary wave co-determined a critical-valued interaction between these causal parameters leading to a discontinuous change in the "energy" equivalent continuity of developmental growth and vertebral column segmentation.

A little more technically: Thom's basic mathematical contributions were in *differential topology* and *analysis* with particular emphasis on what is called *structural stability* of surfaces representing and supporting actions called *manifolds*. For example, in a graph of a function, say F(x), such that a change in cause x determines what happens to the result y= F(x), the stability question involves what happens when one perturbs F(x) with a littleδ, i.e. δ + F(x). Do the *topological properties of the surface representing the potential range of actions of the system* (such as nearness of an originally close point set, continuity and connectedness of the surface, its dimensionality, its compactness as a generalization of finiteness) remain the same after perturbation? Note that the inter-data point metric distances are not considered. If they do, the two dynamical objects being compared are *topologically equivalent.* The test of this equivalence requires the mapping one set onto the other with, at most, smooth distortions of either or both surfaces.

In the context of catastrophe-related *bifurcation theory*, if a δ converts a steady valued *fixed point* to an oscillating *cycle* on a manifold of potential actions, also called a *state space*, then the fixed point system was *not structurally stable*. In phase space, this is seen as a change-in-causal-parameter induced transformation of a dot to a circle. If the one frequency circle is perturbed to a manifold of the system's actions consisting of two independent frequencies, the circle takes the topological form of the crust of a doughnut, one frequency graphed spiral winding around the doughnut, the other winding along the doughnut around its orifice, the circle is not structurally stable. If δ distorts the frequency-amplitude relations on a surface such that the manifold of possible actions is distorted from a doughnut to a tea cup, both topological manifolds being one holed surfaces and therefore *topologically equivalent*, the system is *structurally stable*. Perturbed systems that maintain the sequence of points in time in sequential order (though the distances between the points may be different), are generally structurally stable.

The seductive possibility, one which Thom realized so successfully, was that in the language of distance-independent differential topological forms, there would exist a small, finite set of shapes categorically describing the causes and result parameter spaces from which, even without specific quantities, universal qualitative (including discontinuous) behavior could be described and sometimes predicted. A formal yet general categorical system within which a small set of universal *discontinuous changes in global qualities* could be rationalized seemed seductively applicable to the enlightenment transitions, *spiritual transformations*, appearing suddenly after months and years of disciplined spiritual practice. The Platonic view is that the universal forms of discontinuous change existed before they could be about anything specific, before the universe was born.

In this era of nonlinear dynamics and dynamical system, common dynamical scenarios give accounts of smooth changes in causes leading to discontinuous changes in results. The Nobel Prize winning solid-state physicist, Phillip Anderson, in a short but memorable piece in *Science* in the 1970's said it tersely, "More is different." This general, qualitative mathematical theory of discontinuous change models nicely the sudden delivery of the *first* and *second second winds* from gradually and continuously increasing running distances as well as the abrupt transmission of the guru's "energy", *shaktipat*, from smoothly increasing amounts of chanting, meditation, guru service and Baba love. Gradually changing forces leading to sudden changes in an energy-equivalent result are found in most rigorous form in Rene′ Thom's *singularity-bifurcation-catastrophe theory* applied to *rational mechanics* and *geometric optics*. Here the existence of already solvable computational formalisms makes this more qualitative approach superfluous. On the other hand, the power of this both basic and applied mathematical orientation and method lies in its approach to the qualitative understanding of variously induced global and sudden changes in an energy-equivalent observable in biological, psychological, spiritual and social systems, fields of study in which little abstract and formal lawfulness presently exists. Oxford's Chris Zeeman's more accessible applications of Thom's deeper, more generally ramifying, almost mystical (due to their apparent wide generality) results, include approaches to real world problems such those above as well as the sudden change in excitable membrane potential accompanying the generation of the heart beat and neuronal discharge; mechanisms of opinion change, stock market crashes and, as noted above, the social science of riots. Whereas Thom's *On Structural Stability and Morphogenesis* can be said to be scriptural, Zeeman's Selected *Papers, 1972-1977* constitute the Book of Common Prayer of this church.

To review and place *catastrophe* and *bifurcation theories* in the context of the differential equations of mathematical physics and biology, causal determinism implied by differential equations conventionally requires continuity and smoothness in behavior to be credible. Our intuitions as well as the formal conditions for the generic differential equations of mathematics and physics imply that smoothly increasing amounts of cause lead to smoothly increasing results and yield at least local predictability: a little more leads to a little more, a little less leads to a little less.

This smoothness-dependent intuition of determinism breaks down in nonlinear equations as well as in a wide variety of the machines of experimental physics, from the sudden coherent lasing of previously incoherent light to the vortices and turbulence in suitably bounded rotating or flowing fluid. It took me a while for these topological still shots and movies of the head to become real. Nevertheless, the enrichment of intuition was well worth it. Of course one could smoothly increase the *normal factor* weight of a ship until it gradually sank, but if one moved the center of gravity *splitting factor* to an eccentric position in the ship in the *parameter region of the bifurcation set*, a sudden global capsize before weight-induced gradual sinking made sense. I could see it. Indeed, increasing *normal factor* tension in a prison population that was identified, not alienated, from the officials and mores of the penal institution, would increase social symptomotology gradually. However, increasing the *splitting factor* of social and institutional alienation results in the cataclysmic change of a riot with increasing tension. I could see it.

Do we need to know the causal equations to anticipate instability and discontinuity in our lives? Zeeman making Thom's thoughts accessible to us plain mortals said no. He suggested that we could use *several diagnostic phenomenological signs* to make a good guess about whether we are *near or within the bifurcation set.* Depending upon the route that the causal variables take through the shadow of the bifurcation set, we may see *very large fluctuations* in our observable. The Dow or S&P stock indices in the neighborhood of a sudden large change is often presaged, sometimes for weeks, by a marked increase in volatility, fluctuations between extreme values. Theorists call the statistical properties of a time series of values behaving this way *anomalous variance*. For several months, I did psychotherapy with a genuinely spiritual Catholic priest who only some Sundays served the Eucharist, the corporal presence of our Lord at Communion, wearing no trousers or underpants beneath his robes. A sudden change in a stock index in response to the "shock" of a terrorist attack takes much *longer to settle down* if a cataclysmically bigger change is in the neighborhood. This extension of the system's usual *relaxation time* is sometimes called *critical slowing*. In the bifurcation regime of a schizophrenic break down, *critical slowing* can be both global and literal as the patient freezes in catatonic postures.

In the neighborhood of the *bifurcation set*, big jumps in the stock index, up or down, are possible under almost the same surrounding conditions. This stock analyst-humbling phenomenon is called *bimodality.* Jimmy Swaggert's Saturdays were often spent watching the show at naked dance parlors and buying videos at the pornography shops of Metairie Highway near Schwegmann's Grocery outside New Orleans. Sundays found him on national television engaged with infectiously real, transcendent experiences in the public arena of the pulpit. The ecstatic congregation was deeply moved by his eloquent and tearful sermons about sin and salvation. Counter to most suspicions, this is less conscious fakery than the genuinely felt alternating states intrinsic to the *bimodality* in neighborhoods of *spiritually unstable, born again transitions*.

Similarly, beginning with nearly the same initial values near the boundary of the *bifurcation set*, very similar motions lead to dramatically different results. This counter-intuitive behavior has been called *divergence.* At UCLA's Neuropsychiatric Institute, I interviewed a pair of lively teenage, genetically identical male twins raised by a loving family in Los Angeles's Valley. One was president of his high school class, a Sunday school nursery school volunteer and a Saturday soup server to the poor. The other twin sold pot and cocaine to support his habit. Deep and potentially dark mysteries live in these spiritual bifurcation sets. They leave us pondering child sexual abuse by deeply religious clergy and the massacre by mass suicide of a New Christian congregation by James Jones. We wonder why it is that fundamentalists (Jewish, Christian and Muslim) have the most ecstatic and direct validating experiences of God and do the most shooting and bombing of other people. In Burt Lancaster's portrayal of bifurcation set dweller, Elmer Gantry, charismatic believer and exploitative psychopath, were simultaneous and both credibly real.

Another feature of the occupancy of this bifurcation region in control space is that the values producing a sudden jump that occur passing through going one way along the "normal" dimension usually jump back much further along when moving the other way. Theorists call this characteristic sign of bifurcation land, *hysteresis.* It is generally known that sudden healing changes of the first born again experience can arrive magically fast whereas a run at it a second time, another born again state after the loss of the first one, comes, if at all, with much more effort and difficulty. Members of Alcoholic's Anonymous know that getting on the AA wagon the first time may be quick, joyful and easy. Getting back on this wagon after a fall is much more painfully slow and demanding, analogous to the Carmalite monk; St. John's lost faith engendered suffering of the *Dark Night of the Soul.*

Viewing the instabilities and extremes near the boundary of a bifurcation brings inquiries and advice about why a rational compromise, some form of disciplined moderation, would not be more desirable. It turns out that in this parameter regime, the in-between state is intrinsically *inaccessible.* The pocket in the *S shaped fold* of the upper manifold cannot be attained, at least for very long, by varying the values of the two parameters. However, if one increases the number of controls, it might be possible to stabilize a small island in a parametric sea of instabilities. In an application of this strategy, Smith College and Harvard Professors James Callahan and Jerome Sashin used a geometric representation of the difficult to stabilize region of normal weight on a *double cusp* manifold representing the behaviors of patients with eating disorders with both anorexia nervosa and bulimia. They varied *five controls* to stabilize a very small result area representing normal eating by varying the control values for ability to *verbalize feelings*, to *imagine solutions*, to defend against anxiety with unconscious forgetting called *repression*, to make contact with *realistic rationality* and to *modulate feelings* with say exercise, meditative practice or psychopharmaceuticals.

My experiences with the so-called *borderline personality*, with the tendency toward sudden and global personality change, from Sunday school teacher to Harlot in the space of a breath, has been both sexually exciting and personally ruinous for me in my life. I could feel the instabilities in these dwellers of the bifurcation pockets and my heart raced at the promise of mutually unconsidered impulses, the blurring of orificial identities, the experiments with sexual roles and modes and the incipiency of collapse into regressive mud play. Most of all, I anticipated that their screaming orgasms, potentiated by a natural inclination to bifurcate, would be so messianic as to carry me along to a transcendentally erotic new place. Unfortunately, paranoid rages, bursts of promiscuity and hopeless inconsistency of goals and efforts dominated the remainder of our living days.

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CHAPTER 4:

SENSUAL IN-BETWEEN ENTROPIES

Since the early teens, I've been beguiled by girls and women that have what might be regarded as *exquisite sensibility,* perhaps more precisely, *exquisite self sensibility.* These inhabitants of the near transformational neighborhoods of *bifurcation sets*, are grandly responsive receivers of emotionally significant information arising from their insides and the world. They are the canaries in the deep mines of human experience. Not the usual one lively-eye, one sober-eye, binocular difference of most of us, both their eyes sparkle, their feeling antennae await a happening and each is regarded as new. I spot these brains in a crowd within minutes and am compulsively drawn to know them better, to become part of them, to vicariously experience and serve them. They seem to have little inhibitory control of even weak sensory information on its way to their strong, global feelings. Near ecstasy and excruciating pain await. They feel their anticipations with their body, down to their painted toes. Their receptivity brings me lower abdominal warmth in remembrance.

At sixteen in my Dad-purchased second hand Ford convertible, I was parked with my new girl friend on Sarasota's Lido Beach, hearing and seeing dark shadows of the Gulf of Mexico's waves hit white sand against the night sky. I took her flat party shoes off to message her feet. When I kissed her left foot and sucked gently on her toes, she gasped and became faint. She told me that a strong electric shock had run up her back. The passionate licking and sucking of her musky, moist, pink labial lips brought what she said were explosions of pink and blue lights. She had several ecstatic multicolored crises in a row, sometimes without pause. She begged me to stop. I was as pleased as a sexually inexperienced young man in love could have possibly been.

Bowled over by what seemed to be the uniquely sensual properties of her brain, I began to wonder if her sensitivity was more general when she asked me to keep the windows open or top down, even in the cool of a Florida January, because the exhaust smell in my car was suffocating, though I couldn't smell it. The car had been checked and registered negative for abnormal fumes and leaks by Anderson Ford. She asked me never to wear any kind of after-shave lotion because it choked her. Jazz music on the car radio had to be played quietly. On-coming headlights gave her headaches. Her mother, sometimes desperate, called me for help during her daughter's episodes of premenstrual emotionality and early menstrual discomfort. During these times, we would drive together for hours as she explained the many different colors of lower abdominal pain and how this particular kind yawned darkly before it cramped. It was more purple then any of the others. I tried to explain what I intuited but didn't understand to her mother about the her gift of unfiltered information coming through her nerve endings, her ever readiness for surprise and her brain's unwillingness or inability dampen or ignore what it didn't like. She saw things in art, heard things in music that I only saw, and heard after her telling. She had tearful smiles listening to Debussy's Afternoon of a Fawn. The flatted fifths of Charley Parker and the laconic riffs of Miles Davis made her anxious.

Since then and for all these many years, the same sensually susceptible brains showed up in my life carrying a variety of woman's names and I never lost my fascination for them. I learned that their heightened awareness extended to the spiritual realm with unusually strong metaphysical inclinations and readiness for transcendent experience. They seemed to live closer to the direct experience of God. Attending Assembly of God and other Pentecostal midweek service, I found that praying in tongues and dying in the Lord came as easily and dramatically to them as their orgasmic experiences. At the same time, distant bad news could suddenly become immediate and loud in a litany of threatening thoughts that hooked and persisted through sleepless nights. They taught me to see genuinely the delicate beauty of flowers and to know in my stomach that some forms of sadness felt hollow like homesickness. In medical school I found that that many of them were the clinic patients, women and men, with unusual sensitivity to chemical odors, think Gulf War Syndrome, and fibromyalgia, which I heard as unusually sensitive awareness of normal sensory information about posture and position coming in from the bones and muscles of the body but experienced as pain. This background of odorific and somatic information is usually repressed from consciousness by the rest of us. Their medical histories contained detailed accounts about how each of their organs was feeling at the time, sensations that the textbooks say we are incapable of consciously knowing. Internists and psychiatrists often dismissed their accounts as signs of *somatoform disorder*, psychological conflicts expressed in the language of body feelings.

In the psychophysiological laboratory, I learned these brains tended not to *habituate*. Each of a series of noises continued to elicit *startle responses* that could be picked up in brain wave recordings or in the running record of a psychophysiological, lie detector, machine. In psychoanalytic training, I learned that these brains remembered their dreams more richly than the rest of us and that treatment with over twice a week analytic sessions was potentially dangerous. The psychoanalytical situation-engendered fantasies and feelings could get too strong and exaggerated, too real.

Professor Iris Bell of University of Arizona's Alternative Medicine Research Program has, studying these brains, found slower reaction times, defects in divided attention psychological tasks, longer latencies to the first dream, and unusual patterns of odor reception called *cacosmia* or *dysosmia*. Using brain wave and cardiac interbeat interval data as markers, Bell reports the increase in the amount of *alpha awake brain waves* and decreases in *cardiac interbeat interval variation* associated with increasing sensitivity, rather than habituation, with repeated exposure to a variety of smells over time.

In spite of these brains usually requiring what is known as high maintenance in relationships, I continue to be erotically spellbound, in love with them in all their forms. Questions about how to think about these exquisitely sensitive women, *Bell's Syndrome* exists but is rarer in men, continue to drive aspects of my scientific research. It has been variegated quest, which began with trying to find a general conceptual framework that would help my understanding of this unique capacity to be aware and process large amounts of internal and external information that escape the awareness of most of us. As one might guess, this search led to fundamental ideas about *information* and its inverse, the *entropy* indicating the amount of *information transport capacity*, with respect to their characterization, quantification and measurement.

To get to the end from close to the beginning, we recall that it was Claude Shannon and his followers who both mathematically proved and experimentally verified that a receiver must have more *entropy*, less already fixed knowledge and more wondering, than the sending source, in order for the message to be sensitively and reliably received and encoded. Sensibility seems to have something to do with the readiness for information transmission afforded by the brain's high entropy, minimal fixed information states, in its resting dynamics. Their remarkable receptivity derives from a baseline brain state like the formless emptiness of the *bodhisattva's* "…no form, no sound, no feelings, no perceptions, no consciousness…" of transcendent Tibetan Buddhism as described in the *Heart Sutra of The Dalai Lama.*

In Chinese Medicine, *xu*, meaning *emptiness*, contrasts with *shi*, the word for *fullness*, both of these complementary opposites having multiple specific meanings. Most metaphysically relevant is the characterization of *xu* as the emptiness of the deepest reality of being and the highest state of human spirituality. Like that aspect of Lao-Tsu's ineffable *Dao*, *The Way* that is empty, *xu* indicates a mind devoid of desire, being lucid and serene. In the context of dynamical form, *xu* shares the structureless, non-imagery of maximal entropy systems and *shi* the lower dynamical entropy of fixations on form, desires and beliefs. Shigehisa Kuriyama's *The Expressiveness of the Body*, elucidating historical and conceptual divergences of Greek and Chinese Medicine, notes that *xu* was the supreme end of self-cultivation and the secret to vigor and longevity. "…to achieve fullness of life one had to abide in empty nothingness, *xuwu*." In Lao-Tsu's *Tao-Te-Ching,* "…the Way is gained by daily loss, loss upon loss until…by letting go, it all gets done…"

William James, in *The Principles of Psychology*, tried to capture the subjective dynamics of the brain as an on-going preconscious stream of statistical wave processes. He envisioned autonomously increasing and decreasing coherence emerging spontaneously and from sensorial evoked thoughts via the confluence and disaggregation of statistical wave processes, "…wave crests and hollows…" that achieved temporary statistical stability by "…feelings of relation, consubstantial with our feelings or thoughts of the terms between which they (only temporarily) obtain." In the more receptive, higher entropy brain systems, fleeting forms change without continuity, jumping from one to another with "magical rapidity," *but being not already engaged, are available for use for self-organized structure evoked by new information*. Without ordered, low entropy, preconceived ideational defects in the resting random brain field, the full attentional statistical machine is available to sensitively respond in self-organized, quasi-stable states of *cognitive, conative and affective integration*. They then disappear; this brain relaxes quickly, ready for new experience. This contrasts with those brains that are dominated by islands of order composed of personality fixations and rigid belief systems, *low entropy defects*, which interfere with sensorially responsive *self-organization*.

As in most systems of authoritarian premises, precise definitions and what appears to be strict logical continuity, as in discussions of Torah among Orthodox Jews and Canon Law by Catholic bishops, *classical equilibrium thermodynamic ideas* that are borrowed for use out of the context of their origins, risk the calumny of their physicist practitioners. We have probably already earned more than a little distain from those quarters with our use of none-minimal or none-maximal but *in-between entropies.* This phrase cannot be found in the literature of physics or, as such, in the writings of *communication and information theory*. In the modern theory of nonlinear motion called *dynamical systems*, in-between entropies can be generated by *chaotic systems* that are non-uniform in their *rates of separation of near by points* and *convergence of far-away points* in dynamics that have been previously described as *nonuniformly hyperbolic.*

The energies and their transformations that fuel and support *karmic escape* from the personality fixations of *samsara* and accession to *unmanifest Divine Life* can occur without the loss of the richness and multiplicity of apparent reality. Big internal changes without external sign can occur in the arrangements of the ineffable and mysterious formless silence within which we have associated with states of *high, but not maximal, in-between entropy*. For examples, the Indian Saint, Sri Aurobindo, in the early 20th Century, the Catholic metaphysical anthropologist, Teilhard de Chardin and currently American pandits (spiritual seekers with intellectual and academic inclinations) such as Ken Wilber, among many others over the millennia, direct us toward the goal of Nirvanically changeless emptiness without the properties of space or time. At the same time, we maintain an astute and effective yet distantiated appreciation for existential realities. The *non-dual enlightenment of Integral Being* or *Yoga* involves realizing emptiness through the world of form. There is a way of thinking about and even computing that "nothing within" and its changes.

As John R. Pierce suggested in the 1981 revision of his book that made the theorems of the father of *communication theory*, Claude Shannon, so accessible, "…if we want to understand information-related entropies, it is perhaps best to clear our minds of any (physical) ideas associated with the entropy of physics."

Nonetheless, historical comments about what the *classical thermodynamic term, entropy*, is and is not about are in order.

We recall that Richard Feynmann, in his well-known 1962 class notes, *Lectures on Physics*, said that the subject of thermodynamics is the study of relationships among the heat, energetic and organizational properties of materials, *without knowing their internal structure*. Historically, the relational formalisms of *equilibrium thermodynamics* emerged before our knowledge of the internal structure of matter. For examples, the pressure in an insulated container of gas is due to molecular bombardment of the container walls, which increases with heat or compression of its volume. Compression of its volume increases its temperature and expansion of its volume leads to cooling. Note that these relationships hold without specifying the constituents and the specifics of a particular gas or solid.

In his lectures, Feynman's intuitively accessible examples of reversible thermodynamic properties are reminiscent of his on camera performance at the Senatorial hearings about the Challenger disaster. Recall that he dropped an O-ring in a glass of iced water demonstrating cold-induced rigidification of the rubber ring, which he postulated to be the cause of the fuel leak and resulting explosion. In his *Lectures,* he said that if one holds a rubber band between ones lips as a crude thermometer, stretching a rubber band heats up the lips and relaxing it cools them. Working the same system in reverse, and *equilibrium thermodynamic systems are classically reversible*, we find that heating a rubber band makes it contract. These changes involve complicated alterations in the internal arrangements of the polymeric strands of rubber, their structural properties, the details of which, for the purpose of global thermodynamic characterization, need not be known. The *relationships between physical state, energy and temperature* in this material were predictable from *thermodynamic laws* even without specific knowledge of the complex internal structure and physical dynamics of rubber.

Thermodynamic theory, which makes deep conceptual connections between *quantitatively measurable primitives* such as *heat, hotness and work* and *the invisible* in the form of derived ideas such as *energy and entropy*, yielded an enormously rich and logically consistent intellectual framework from within which to characterize macroscopic behavior composed of unknown molecular mechanisms. Ideas about entropy grew out of William Thomson's (a.k.a Lord Kelvin) thermodynamic laws about *energy conservation* and its allowable transformations. Later Clausius decomposed the *energy* into that which was available for mechanical work, called *work-content*, and that which was not, called *transformation content*. He referred to the *transformation content*, a reflection of what changes in the internal order properties of the system that occurred as a concomitant of changes in energy and heat, as the *entropy.*

Rudolph Clausius added the word entropy as a thermodynamic property to the conceptual armamentarium of theoretical physics in about 1865. This followed the earlier work of the French engineer, Nicolas Leonard Sadi Carnot, who was trying to develop a theoretical framework within which efficiencies in heat-generating engines might be understood. It implicated positive, > 0, changes, *d*, in *entropy*, *S,* with changes in time, *t*, *i.e.* $\frac{dS}{dt} > 0$, entropy is increasing in time, as a concomitant of the inevitable mechanical inefficiencies in an energy driven system. The resulting losses in the form of *wasted energy* show up as increases in *molecular motion*, which could be *estimated from the increases in heat*. Wasted energy dissipated as heat increases the amount of random motion and volume occupied by the surrounding molecules in physical processes involving *heat, pressure, vaporization, condensation* and *work*; all elements of that era's dominant physical metaphor, the *steam engine*.

The highly developed, multifaceted, often quite abstract formal characteristics of the inferred property, entropy, prevent glib definitions and generalizations. In the context of Kelvin-Clausius theory, the entropy of a closed system will remain the same if it is isolated from any matter or energy exchanges with the environment. If heating a system such that the change, *d*, in heat, *Q*, is positive, *i.e.* $dQ > 0$, it experiences a rearrangement in its microstructural motions, but the temperature is left unchanged. The (inferred) entropy, *S*, increases (i.e., $dS > 0$) as the ratio of change in added heat, dQ, over the unchanging, absolute temperature, *T*. Thus, one definition of entropy change is *d*S = *d*Q/*T.* In classical contexts, *d*S is expressed in *units of heat* called *Joules per degree of absolute temperature* in units Kelvin, the temperature in Centigrade plus 273.16°. The best-known physical image involves the heat-energy transfer to and from heat baths called *reservoirs* as intermediate actions of the work of the heat driven engine executing what has come to be known as the *Carnot Cycle*. The same formulation emerges in this more concrete context: the heat, *Q*, transfer, *dQ*, at a particular absolute temperature, *T*, *dQ/T*, has been used to define an entropy change, *dS* = *dQ/T* related to some not-need-to-know-about specific alteration(s) in a system's internal physical properties.

If one allows some loose thinking about *heat-induced increases in the statistical randomness of molecular motion* in the above reservoir that is associated with the loss of *useable* energy, the positive entropy change, *dS* > *0*, is vaguely relatable to the kinds of *information entropies* to be discussed below. If a gas trapped in an insulated, physically *isolated*, closed cylinder is allowed to expand *infinitely slowly*, *reversibly, called adiabatically*, pushing up the piston that closed off its end, the gas will become cooler, energy having been expended doing the work of lifting the piston. Defined as an isolated system (of course no where in the real, non-laboratory, world can this condition of absent exchanges of energy or matter with the environment be found), it is a *reversible* process, because returning the energy of the work by, again, *infinitely slowly* pushing down on the piston and compressing the gas to its original volume, returns it to its former temperature-defined energy state. In this historically prominent thought-toy of physics, there has been a *reversible* change in energy but no changes in the entropy, *dS* = *0.* The gas's *heat, temperature* (and *energy* and *volume*) can be completely restored in this metaphysically mythic classical thermodynmical tale of an entropy-conserving, reversible process.

While fixed entropy and independence of the specific path is the case for the above noted abstract reversible cycle, in the real, irreversible orbits of most physical and all biological systems, entropy increases, *dS* > *0.* Walter Nernst's 1907 *heat theorem* yields a zero point from which to determine a difference measure in the postulated, real physical world of ever-increasing entropy. He showed that at an absolute temperature of zero, entropy is zero. We can illustrate an approach to this singular state by placing a heated metal rod in ice water which would result in a decrease in the entropy of the rod's molecular motions by $dQ/ T_1 < 0$, the cooling reducing the complexity of molecular motion in the metal bar and an increase in the entropy of the water by $dQ/T_2 > 0$ indicating an increase in the amount and complexity of the surrounding water's molecular motions. Of course the heat moves from metal rod to the water as $T_1 \rightarrow T_2$ making $dQ > 0$ positive and the entropy change, $dS = dQ/ T_2 - dQ/ T_1$, also positive. In another simple example, producing friction by rubbing a surface generates heat, $dQ > 0$, at a temperature T. This induces a positive change in entropy, $dQ/ T > 0$, in the form of increasing amount and complexity of the patterns of molecular motion in the air surrounding the rubbed surface.

Using another related and well-known thermodynamic thought toy, the original isolated, insulated body of gas in the cylinder is partitioned by a membrane into two chambers, one containing all the gas with its temperature, pressure and ability to do mechanical work and the other a vacuum without these properties. This equilibrium state is changed into another equilibrium state by suddenly removing the membrane, filling both chambers with gas and, while increasing its entropy *irreversibly*, $dS > 0$, *removes* at least some of the gas's ability to do piston raising work. In the context of classical thermodynamics, it is in this way that *irreversibility can be defined by its associated increase in entropy.* Though there has been no change in total energy in this insulated closed system, an increase in entropy means a decrease of the energy available for work. The *increased disorder* in the gas is associated with the loss of ability to convert heat, thermal energy, into mechanical energy. Historically important and still available elementary texts by Enrico Fermi (1936), Mark Zemansky (1957) and Herbert Callen (1985), among many others, explicate clearly the formal, but far from biologically relevant, classical theory of the *physical entropy of closed equilibrium thermodynamic systems.*

Growing in part out of the formal thermodynamics of physics, *statistical mechanics* offers yet another set of intuitions about the not-necessarily-known molecular details associated with changes in entropy. These ideas are closer to applicability in problems of making measures on the behavior of biological systems. Very generally, in the statistical mechanical context, an increase in entropy means a decrease in the order, which can be a quantitative observable reflecting a decrease in predictability and/or knowledge about the system. For example, we can locate the molecules of the gas more accurately when they are all on one side of the membrane-partitioned cylinder compared with the situation when the membrane is suddenly removed. This accompanying *increase in ambiguity and decrease in knowledge in locating a set of gas particles reflects a statistical mechanical view of increases in entropy.* Can anything general be said about the bounds on an increase in entropy? The statistical developments of the Yale mathematical physicist, Josiah Willard Gibbs (about 1875), consonant with the logical arguments of the Greek mathematician, Constantin Caratheodory (about 1910), conclude that the *entropy increase goes to the maximum allowed by the constraints imposed by or upon the system.* A change in likelihood as a *probability* is a characteristic way to quantify the *entropy change*, reflecting an alteration in knowledge or its reciprocal complement, *uncertainty*. The system's entropic uncertainty said more colloquially, and relevant to the *Bell Syndrome's* women of my life, is its *capacity for surprise.*

A statistical mechanical approach to the total entropy of a bounded set of molecules in motion involves summing this property across all the participating molecules. We let N be the number of particles involved. As a problem in Newtonian mechanics, each of the N particles is represented in 6N dimensional phase space. That means that each point represents one of the N molecules in the *three dimensions of location space* plus *three dimensions of motion space as its velocity*, more specifically, the product of *mass times velocity called momentum*. This adds up to 6 dimensions of measurement. This so called *phase space reconstruction* of the molecules of a gas as individual particles are a daunting task, though fast computers and new algorithms are making computations from first principles more generally attainable. Those based on the *first principles of short-range repulsion and long-range weak attraction among particles* and the bumper-car *collision* dynamics between them can now be implemented if the system of particles being simulated is sufficiently small and the computer simulation is for very short times.

To transform the entropy into something more statistical and global, we return to the theoretical work of Ludwig Boltzmann whose formalism was used previously to quantitate pathological developmental simplification. He assumed that given a set of constraints, say the closed volume, *V*, of a box, *B*, of a fixed size, *V* (*B*), the orbit of each particle would eventually explore all the space in the box that was available to it. Boltzmann's entropy became a constraint dependent, n-dimensional volume measure, with the assumption that the entropy, *S*, equals the logarithm of this volume measure, $S = ln\ V(B)$. To calculate a value for the entropy, compute the volume of the molecular motion as determined by the invariant constraints of the system, such as the volume, temperature, pressure and/or its total number of molecules. We may *partition*, discretize, the volume up to some limit of resolution such that it is divided into Ω small boxes, each containing the representation of a particular state.

Making the same assumptions of closed system, equilibrium thermodynamics, such a system is completely isolated from outside sources of matter and energy, it spends equal time in each of its Ω available states. In such a case, the *characteristic occupancy time of any state is inverse to the number of states available*, e.g. $1/\Omega$, and the system's *entropy is maximal* for that set of states. Under these conditions, $S = k\ ln(\Omega)$, where the *k* term is the Boltzmann constant that contributes to the numeric units of entropy, as above, in Joules of heat /degrees Kelvin of the temperature. If the system is in *contact with a heat bath*, but cannot exchange matter with its environment, it is called *diathermally isolated*. The distribution of times spent in the available states of a classical diathermally isolated system of gas molecules can be represented by what is called a *Boltzmann distribution of probabilities of state occupancies*, ρ (as a function of their energy level, more measurably, their responsiveness, *susceptibility*, to heat). Here the *characteristic time* of the system spent in each state varies as the particular state's *probability*.

Leaving the framework of physical thermodynamic entropies entirely, the *entropy of information* was introduced in the context of *communication engineering* in electrical and electronic devices. The metaphorical machine for the current age of entropy, analogous to the role of heat and steam engines in classical thermodynamics, is the *computer.* Energy in this context is a relatively trivial property. Ammeters and other monitors of load are unable to discriminate between a computer actively engaged in encoding and computation or one simply maintaining its dynamic memory while resting in computational readiness. This situation is very analogous to the results of early work discussed previously on the metabolic rates and sources of the *whole* brain's energy, oxygen and glucose metabolism, by National Institutes of Mental Heath's Seymore Kety and Louis Sokoloff and the State of Illinois Thudicum Laboratory's Harold Himwich. Using whole head arterial-venous, energy-in, energy-out, differences, they could not demonstrate differences in rates of whole brain metabolism between states in which the human subjects were engaged in solving mathematical problems or deeply sleep. In today's brain imaging research, using a variety of physical reflections of the brain's metabolic activity, it is the *differences in regional distributions of metabolic activity* that are relatable to subjective and behavioral states, not differences in total amount of energy expended. In graphically coded representations of the regional metabolism of the brain in action, one or another or many areas "light up" and others "grow dark" in correlation with changes in thinking, feeling and action.

The *entropy* first developed by Claude Shannon was formalized for use in 1948 in what was then called *communication theory* and now *information theory*. It represented a measure of the *ambiguity* and *uncertainty* that had the potential for being resolved by new knowledge. In this context, *entropy and information were obviously complementary descriptors*. A message that informs us about which of ten possibilities should be chosen contains less information than one that informs us about the proper choice to be made from among a thousand possibilities. The entropy of communication theory is a measure that is computed on uncertainty. The *information reception capacity* of a system is dependent upon the *amount of* *uncertainty in the receiver that pre-existed the receipt of the message.* In the binary coding scheme of digital electronic operations, the unit of information is the *bit*, a choice made between 0 or 1 in the resolution of a two state ambiguity at each place of some power of two number of places. Our relatively common computers these days have 32 or 64 bit processors. If these 0,1 choices are made in a random sequence in which each step is independent of the previous one, the sequential probabilities, .ı ˜ are multiplicative: e.g. the probability of getting two 1's (heads in a fair coin) in a row are the product of each 0.5 probability: $\rho_1 = 0.5 \times \rho_2 = 0.5 = \rho_1\, \rho_2 = 0.25$. Using the common base ten system of logarithms to demonstrate the algebraic fact that *multiplicative probabilities are logarithmically additive* (and ignoring the minus sign that comes with making logarithms of the decimal fractions of probability), we notice that $log_{10}(0.5) = 0.693147$ and $log_{10}(0.25) = 1.386294$ and that 0.693147 + 0.693147 = 1.386294.

The dot-dash choices of Morse code machines, the go, no-go gates of transistors, the open versus closed ion channel-mediated neuronal membrane discharge and the left, right spins of the single electrons of today's quantum computers lead naturally to an information encoding of multiplicative sequences as the sum of logarithms in base (equal to the number of available states) two, each $\rho = 0.5$ choice called, $log_2(0.5) = 1$, a *bit.* Shannon's 1938 master's thesis mapped George Boole's algebraic scheme for doing yes-no, either-or computation onto current switching devices such that circuit closed was "true" and circuit open was "false." Using Boole's laws such as "Not(A and B)" always equals "(Not A) *or* (Not B)" led to schemes for circuit routing through electronic gates which also serve for information storage in gadgets ranging from cell phone directories to computer hard disks.

Following Claude Shannon, each logarithmically additive entropy term is expressed as the sums, Σ_ι of its probability, ρ_ι, times the probability's logarithm, $\Sigma_\iota(\rho_\iota \times log_2)$ ($\rho_\iota$in base two. A *logarithm is an exponent of its relevant base* such that, for example, the logarithm, base two, of $2 \times 2 \times 2$, 2^3, = 3 and 3 bits can encode eight binary (0,1) numbers: (000, 001, 010,011,100,101,110, and 111). Shannon used a hill-like, called *convex, entropy function S* $(\rho) = -\Sigma(\rho \ln(\rho))$. *The amount of* *information required to gain knowledge of an event is dependent upon the probability of its occurrence*. $log_2(0.5) = 1$ is the maximal entropy when modeling the equilibrium entropy of an independent random 0,1, (heads or tails) series of informational states as might result from flipping a fair coin a large number of times. This value would be maximal when the coin was fair, ρ(heads, tails) = 0.5, and the entropy would be 2(number of allowed states)×0.5(probability of occupying each state)×log_{10} (0.5) = 0.693147...or in *bits*, $log_2(0.5) = 1$.

More generally, if system's behavior is *distributed equally among its possible states, the Shannon entropy is maximal and equal to the logarithm of the number of defined states*, for example, $log_2\ (2) = 1$. Shannon's classical equation about information content says the amount of information, $I = -\rho\ log_2\ \rho$, measured in bits. The minus sign in this reciprocal relation indicates that the information content of data, *I*, goes up as the probability of occurrence of the observed data, ρ, goes down. Since soon we will be talking about brains and their various styles of information encoded content as well as its transmission, we note the other famous Shannon theorem dealing with limits on the channel capacity, *C*, for information transport is $C = Wlog_2(1+S/N)$ where *W* is bandwidth, the range of frequencies available for information transport, *S* is the strength of the signal and *N* is the strength of the noise. Recall that the $log_2(1) = 0$ so only the signal-to-noise ratio, *S/N* contributes to the value of the product of the multiplication by bandwidth, *W*. Transparent clinical examples come from studies of the perceptual and cognitive decline in normal geriatric patients in which the range of aural frequencies (*W*) heard without augmentation decreases with age as does the frequency range (*W*) observed in their resting brain waves. The inattentiveness of the obsessively worried ruminator can be used as an example of brain channel capacity being reduced by the amount of on going head noise, an increase *N*, which, of course, reduces the value of *S/N* and therefore *C.*

Measures of the *informational complexity of systems in motion*, in contrast with the *information content of a static equilibrium state*, are of *dynamical entropy*. Dynamical entropy is often called *H,* in contrast with thermodynamic and/or informational entropy, *S*. One can begin with a representational image of the location, velocity and directional tendency of every point generated by a dynamical system by an arrow on the surface of action, the *manifold*, of a dynamical system. This field of arrows indicating directional and strength of motional tendencies is called a *vector field*. A vector represents its location at the base of the arrow, its velocity by the length of the arrow (called the *modulus*) and the direction of the motion by the direction of the arrow. If we regard all moduli as equal to one, every vector on the surface has the same length. The resulting graphs are called *direction fields.* Looking at a stop-action photograph of any point on this surface, its associated vector informs about where the system would take it over the next unit of time. The whole surface can be marked by initial points, which the dynamical systems move as they generate patterns of orbits of moving arrows in time. The following two brain and behavioral experimental circumstances make this depiction and its relevance to dynamical entropy more concrete.

We review in more detail the concrete and visualizable findings from experiments requiring the quantification of characteristic patterns of motion in animals and man. They can be embedded into a similar surface-like setting, which might be called a *behavioral manifold*. For examples, my students from the past, Martin Paulus and Mark Geyer, now Professors at the Medical School of the La Jolla branch of the University of California studied the effects of psychotropic drugs on the patterns made on the floor by rats of various genetic strains while they wandered about, in *exploratory behavior* in a bounded space. Monitored by a video camera placed above the ceiling less cages, the patterns made by the paths taken by the rats over time were reconstructed as *vectorial orbits on a behavioral manifold*. This manifold was then repeatedly *partitioned*, *covered* with, from just a few large, in graded progression, to many smaller boxes, each partition composed of rectangular lattices of a particular size. Units of time were also partitioned into range of units from larger to smaller durations of observation. Differences in the rat's *genetic strain* as well as injections of *stimulants, antidepressants* or *antipsychotic drugs* resulted in characteristic and discriminable path geometries mapped onto the behavioral manifold as orbital patterns. Each path was encoded as a sequence of size-dependent numbered boxes that were entered and occupied or left. The new information being generated by the pattern of spatial orbits took the form of sequences of numbers or symbols representing the sequence of labeled boxes. The complexity of these numeric or symbol sequences was then quantified in a variety of ways including the use of *two fundamental measures of dynamical entropy*.

One measure reflects how many new, previously unexplored boxes were entered by the rat per unit of time. This rate represents a percent of the *possible*. The second measure reflects how much of the time did the rat in each box visited as a distribution of the *probable*. The *rate of expansion of the possible* and the *relative time in occupancy of these possibles*, *the probables*, form the bases for the computation of these *two kinds of entropies*. For example, the work of Paulus and Geyer showed that the administration of a very small amount of stimulant drug, compared with a salt water control, led to an increase in the first measure of the number of new, previously unexplored, boxes entered per unit time. With respect to the second measure, the stimulant drug augmented exploratory activity was also more uniformly distributed over the possible boxes, making for more uniform probability. Administration of higher doses of stimulant drugs, at a critical dose, led suddenly to more spatially and temporally restricted and stereotyped patterns of motion of the rats, compulsive circling alternating with frozen sniffing. Both contributed to a *decrease in the possible* and *nonuniformity in the distribution of the probabilities*. In man, low doses of amphetamine tend to increase the rate and creativity of thought streams and high doses generate fixed ideas and paranoid delusions. In the statistical approach to nonlinear dynamical systems, time-dependent *generation of new possibilities* is called *topological entropy*, H_T and the entropy associated with the *distribution of probabilities* is called the *metric entropy*, $H_{M.}$ These kinds of entropies have also been used to quantitate characteristic patterns of in human behavior as well.

We have previously mentioned these measures as used in human experiments by Karen Selz, a Research Professor of Psychiatry at Emory University in Atlanta. Recall that she devised a set of experiments leading to unobtrusive measures made on human subjects by asking them to remove, as many as they could, the dots in a lattice, one by one, from the computer screen, by clicking on each point with a mouse. In some experiments, after removal, the dot reappeared in fifty milliseconds, in the "fast return condition", or after one-second delay in the "slow return condition." Unbeknown to the subject, the path made by the motions of their mouse on the computer screen over time while removing dots were reconstructed as a path on a fine to coarse grained box-partitioned behavioral manifold. Entropic indices of the rate of expansion of the possible, number of new boxes entered, reflecting H_T , and the relative occupancy of the partition of the possible, reflecting H_M, the distribution of probabilities with respect to the boxes, could then be computed. For examples, Selz found that the spatial and temporal patterns of computer mouse motions made in this dot search and destroy task correlated highly with the subjects' age, sex and personality types as defined by profiles from the Minnesota Multiphasic Personality Inventory, MMPI, and the Structured Clinical Interview, SCI, associated with the standard Diagnostic and Statistical Manual, DSM IV. She found that subjects whose personalities were like my high self-sensibility girlfriends demonstrated high indices of both H_T and H_M.

The actions of *nonintegrable* nonlinear differential equations, not solvable by the usual techniques of integration, can be transformed into graphical images by plotting their orbits in abstract *phase spaces* with the three physically measurable coordinates of *location* x (or some other temporarily fixed *value*), *velocity* y (the rate of change in the location or measured value) and z *acceleration* (the rate of change of the rate of change in location or value) in *x, y, z space*. Graphical representations of the system in action *in phase space* can serve in place of analytic solutions to the equations. This idea was one of Henri Poincare's major contributions to mathematics and physics, and has come to be the centerpiece of the *qualitative theory* of *differential equations.* The often point-to-point unpredictable but globally and qualitatively characteristic geometric shapes of the orbital patterns in abstract *phase space* are the objects of interest. There are visualizable representations such as cycles as circles and statistical measures made on these objects such as the H_T and H_M entropies and the *in-betweenness* (neither maximal nor minimal) of their difference.

A global statistical context for these qualitative differential systems was inspired by the Russian mathematician, Andrei Nikolaevic Kolmogorov. In his now famous foundational talk about the stability of *classical mechanical systems* in the final session of the 1954 International Congress of Mathematics, he gave public birth to, among other ideas, what has come to be called the *ergodic or statistical, measure theory of dynamical systems.* Here, *ergodic* means the existence of an *invariant statistical measure* on the phase space attractor of the system that can be obtained using a variety of equivalent methods and beginning the count at any of its points. Two phase space objects generated by a dynamical system may look different in phase space but their statistical measures may all be the same, i.e. *invariant*. These qualitative orbits in a box-partitioned space can be visualized as Paulus and Geyer's rats exploring a space and Selz's path sequences of computer screen dot quenches produced by clicking on them with a computer mouse.

A precursor of Kolmogorov's *ergodicity* was the earlier ergodicity of Ludwig Boltzmann. This describes a *suitably partitioned* system such that *equivalent values* come from quantitating the behavior of *one single orbit* exploring the space of the lattice of boxes over very long times time as those obtained from a single aggregate photograph of *all orbits run from all possible starting places simultaneously*. The ergodicity of gas-like molecular randomness implicates systems being in one of only two possible equilibrium statistical states: *measure zero* (at most occupying a single point, zero, *minimal entropy*) or its "complement," *full measure one* (occupying all available space in a state of *maximal entropy*). Joseph Goldstein, a well known teacher of meditation, giving advice recorded in Daniel Goleman's 1977 book on the subject said that all methods of nirvana directed meditation amounted to "…simple mathematics …all systems aiming for One or Zero—union with God or emptiness." In place of the maximal or minimal values for the H_T and H_M entropies of these states of transcendence, we in the world of *samsara* are stuck in states of *in-between entropy* which *invariant statistical measures* of on *phase space shapes* help quantify.

To generalize measures made on rat and computer mouse paths to more general and idealized systems, after plotting an *orbital path* in a *phase space*, we may *partition* the space of values taken by the journey of the orbital action generated by the equation over time with rectangular grids of increasing fineness. The result is an *equipartition* of phase space such that there is at most one orbital point in each rectangle of the grid, with, of course, many rectangles in the finer grids being empty. This final grid partition is called a *generating partition*. The proportion of the available boxes of the partition occupied by points is called its *area* or *volume measure*. This measure has been given a variety of names including *Liouville, Haar and Lesbegue measures*. If every box is occupied, it has *measure one*. If at most one box, it has *measure zero*. If we allow partitions to be non-uniform and/or not fine enough to be generating and apply probability weightings for how many points fall into each particular box of the grid, the method is called the *Sinai-Ruelle-Bowen* or *SRB* measure after Kolmogorov's students and followers, the Russian, Ya Sinai, the Belgian Frenchmen, David Ruelle and the American, Rufus Bowen.

Similar to the *SRB measure*, the distribution of box occupancy probabilities multiplied by their logarithms and summed over all cells of the partition yields a statistical measure that is close to the *informational entropy* of Claude Shannon as described above. It is called the *metric entropy* ($H_M = -\Sigma(\rho_i \ln(\rho_i))$, where *H* means entropy and ρ_i is the proportion of the total observations that occupy cell i of the phase space or state space partition. It was the above noted Russian father of modern dynamical systems, Kolmogorov, who in 1956 proved that the *Shannon metric entropy is a quantifiable invariant of systems even in very complicated motion.* Stanford University's Donald Ornstein won a Field's Medal (the under forty year old mathematician's Nobel Prize) for his late 1960's work proving that the Shannon *metric entropy*, H_M, was the only invariant for a large class of appropriately defined, *expansive* (near by points separating in time) dynamical systems. Recall that we refer to *metric entropy* reflecting the relative occupancy as *probability* among the *possible* boxes (or states) as H_M. H_M is maximal when the percentage occupancy of all occupied boxes is uniform.

IBM's Roy Adler in New York and Brian Marcus in California, Hebrew University's Benjamin Weiss, Warwick University's English mathematicians, William Parry, Peter Walters, Mark Pollicott and others developed and proved the relevance of a related measure of the rapidity of dynamical expansion, the generation of new information seen as the rate of entering new boxes of the partition, a logarithmic rate of expansion of the *possible*. Counting the number of previously unoccupied squares entered by the dynamical systems orbit per unit time over the generating partition, for instance, yields an estimate of entropy that, as in the rat and computer mouse examples above, is called the *topological entropy*, H_T. H_T, is about how much new information is being generated by the system per unit time. Theorems have been proven that H_T *is a maximal estimate of the global dynamical entropy with* H_M *proven to be a minimum estimate.* Monitoring single or aggregate molecular motion in a system with the *maximum randomness* of a space filling gas, we find that, on the average, every box is entered and occupied uniformly such that $H_T = H_M$ or said another way, $H_T - H_M = 0$.

As evidenced by the above described experiments in rats and people, the same entropic relations (but usually not with maximal or minimal measure) can be found in biological systems. We have previously described the manifold geometry of a generic (typical, idealized) nonlinear dynamical systems as *hyperbolic* defined by the presence of simultaneous but decomposable components of the motion including the straight ahead and round and round actions on the center *manifold*, the new possibility generating, expansive, away from the center manifold motions along *unstable manifolds* and the back to the center manifold, contracting motions, along the *stable manifolds.* Uniform expansive and contractive influences in the flow leads to *mixing of the order of the initial sequence* of the values inscribed by the orbits. This results in maximization of the entropies and satisfaction of a concomitant of the uniformly hyperbolic condition, $H_T - H_M = 0$.

These clean and mathematically proven findings do not hold for the quasi-mess that is human neuropsychobiology. Enmeshed as most of us are in only *intermittently random* or *nonuniformly hyperbolic systems* with the *in-between entropies* of the only apparently real world of *maya*, $H_T - H_M \neq 0$. How the $H_T - H_M = 0$ of uniform hyperbolicity fails, $H_T - H_M \neq 0$, and along with it the dispassionate detachment of entropic emptiness and fullness, becomes a problem not unrelated to the existence and quantitative qualities of personality styles and their dissolution with return toward but not reaching the maximally entropic openness, flexibility and naïve credulousness of the in Jesus and Holy Ghost occupying transcendent dynamical states. We are all stuck somewhere in the range of measures indicating *in-between entropies.*

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CHAPTER 5:

SOME ENTHEOGENIC ENTROPIES

In the spring of 1968, members of my laboratory team were looking for new brain metabolic pathways of the essential amino acid *tryptophan*, the dietary precursor of the human mood, sleep and libidinal neurotransmitter, *serotonin.* After struggling for several months to identify an apparently new compound, which turned out not to be new but only new in the brain, we collected evidence for a human brain enzyme that could catalyze the production of an LSD-like hallucinogen, *dimethyltryptamine*, DMT. Tracing its metabolic origins, we found that DMT was derived from tryptamine, a common metabolite of the essential and omnipresent amino acid, tryptophan. This enzyme and its metabolic product were located in highest concentrations in brain stem systems that influence the neural regulation of the heart, blood pressure, temperature, breathing, vomiting and primitive approach-avoidance behavior. It was also found in limbic brain nuclei thought to modulate the emotional coloring of perception and thought. Richard Wyatt, working at the National Institutes of Mental Health found DMT in the urine of schizophrenic humans. He also showed that DMT increased significantly if tryptamine's normal pathway for degradation was blocked by *monoamine oxidase inhibitors*, such as

Nardil, Marplan, Eutony, Parnate and others of a then common family of antidepressant drugs.

The presence of a DMT-generating enzyme in human brain was particularly exciting because we knew from the work of Harvard botanist, Richard Shultes and others, that DMT and the monoamine oxidase inhibitor, *beta carboline,* are combined in a mixture of the leaves of a shrub and the bark of a vine, both Amazonian plants, used together by the *shaman* of Peru, Colombia and Ecuador for thousands of years to evoke mystical experiences in themselves. In their state of chemically-facilitated, spiritual transformation, they were better able to engage in healing and divination of others. More recently this and other similarly acting biochemicals have been called *entheogenic,* "connecting to the sacred within."

Consistent with our neurochemical findings in human brain, the shamanic concoction, called by many names including *ayahuasca* and *yage*, combined the DMT containing plant, *Psychotria viridis*, with an extract of a vine with the powerful monoamine oxidase inhibitor properties of the *beta carbolines* found in *Banisteriospsis caapi.* In 1975, working with a graduate student, Louise Hsu, we found that the mammalian brain could also synthesize *beta carbolines*. This family of compounds from the vine protects the tryptamine substrate as well as DMT from metabolic degradation such that it could circulate in the blood long enough after oral ingestion for enough to cross the blood brain barrier to induced prolonged and dramatic alterations in perceptions, feelings and thoughts. In addition, the *carbolines* of the *Benisteriospsis* component extended the time of action of DMT beyond the 15-30 minutes of effect of DMT when injected alone in human subjects. We found it fascinating that the human brain made combinations of DMT and *beta carbolines* similar to the blend that indigenous shamamic chemists discovered as an entheogenic from plant sources.

Ralph Metzner, in the introduction to his 1999 collection of papers called *Ayahuasca* concluded that "...it is widely recognized by anthropologists as being...the most powerful and most widespread of the shamanic hallucinogens." William Burrough in a 1953 City Lights published book written with Allen Ginsberg, *The Yage Letters*, said that *yage* "...gave entrance to a city where all human potential is spread out in a silent market…" It was generally believed that with adequate spiritual preparation, *ayahuasca* could generate transcendent states that allowed access to ones inner being and the beings of other worlds that could serve as sources of mystical knowledge and healing. The *Shams dervish* of the 13th Century, wandering the Turkish portion of the Silk Road, used the word *sohbet* to describe the inner land of *mystical conversations about mystical subjects* that their *turning meditation*, whirling, and the shaman's entheogenic compounds such as DMT give entrance.

The question was whether our finding of DMT and its human brain enzyme had been an artifact, an accidental laboratory fluke. Members of my neurochemical research teams at the University of California Medical Schools in Irvine and La Jolla, notably Dr. Lee Poth, now a professor of pediatric endocrinology at the Uniform Services Medical School in Washington D.C., demonstrated that the DMT synthesizing enzyme existed in the brains of recent accident victims that as far as we were able to learn from their family and social histories, had been completely psychologically normal. More than a little bit startled by this finding and worried about making a sensational scientific mistake, we repeated the experiments with a variety of controls with the same findings. Though our original estimates of the human brain enzyme concentration were on the high side, we confirmed the general finding and published them in *Science* in 1969 and *Nature* in 1970. Our carboline work was published in the *Journal of Neurochemistry* in 1975. A year or so after our *Nature* paper was published, the Nobel Prize winning neuropharmacologist at the National Institutes of Mental Health, Julius Axelrod, confirmed the presence of the DMT biosynthetic enzyme that converted the tryptophan product, tryptamine, to DMT in mammalian brain tissue. We were both delighted and relieved.

We speculate, perhaps too grandly, that this finding, along with the *beta carboline* human brain synthesizing capacity, supplies one of many possible neurobiological and neurochemical mechanisms for the claims of the cross-cultural universality of mystical experience. We all had human brains with these enzymes. The idea that the phenomena accompanying primary religious experience were common to all cultures was a major theme of the life's work of the philosopher-psychologist, William James, and was studied using fieldwork by anthropologists such as Bronislaw Malinolowki as described in his classic book, *Magic, Science and Religion.* Was this neurochemical-behavioral organization an evolutionarily adaptive mechanism selected so that some spiritually gifted individuals self-selected from a severely stressed population could escape and then lead the rest of us out of a sense world that had become intolerable? Could this be an antidote for the hopeless, without materialistic solutions and trapped in a belief system of spiritual nihilism? Was this a brain chemical transcendence escape and spiritual delivery system for the suprapsychological survival of those in dire need? As the 13th Century Islamic mystic, Jelaluddin Rumi, has written, "If a tree could fly off, it wouldn't suffer the saw…" and more concretely, "…if you can't go somewhere, move into the passageways of the self…," a spiritual escape via a neurobiological road to the God-space within.

What followed were a few years of occasional exploration of an "inside out" understanding of the mystical states evoked by the entheogenic family of chemicals. There were varieties of settings for these personal experiments. I found myself LSD-lost, circling endlessly in the tall silence of a Northern California redwood forest. I tried on Hunter Thompson's *mescaline* lenses for the experience of Las Vegas unfiltered. I was expertly mentored in these quests by a distinguished collection of guides: Cultural anthropologist Michael Harner who taught me about the *yage* and *datura* use among the shaman of the *Jivaro*; Social anthropologist, Barbara Meyerhoff introduced me to the personal renewal rituals of the *peyote cactus*-using *Huichol Indians* of the Southwestern Sonora Desert; Neurochemically sophisticated Sidney Cohen, founding director of the National Institutes of Health's Institute on Drug Abuse, told me stories of his involvement with Aldous Huxley and Barbara Brown in the Los Angeles covey of early American LSD explorers; organic chemist Albert Hoffman, Sandoz's designer of a series of ergot alkaloids including LSD, told me stories of his accidental post-sniff hallucinations while returning home on a bicycle; An anonymous group of us conducted personal experiments with Sacha Shulgin, the University of California at Berkeley professor who first synthesized and tested the mescaline-derived, *Ecstasy* series of compounds; We did some work with the dissociated anesthesias (producing wide awake but not there states) having consulted with John Lilly, a brain scientist who used these agents as a courageous self-medicating explorer of sensory isolation tanks; I met several native shamanic practitioners including the Huichol Indian that was the model for Don Juan in Carlos Castanada's five volumes of pseudoethnography written up in my essay "Is Don Juan Alive and Well?" in *The Pushcart Prize of 1977*. Issues of culture and brain chemistry came together in several accounts about entheogenic, mescaline-containing peyote use among the Huichol Indians in a book edited by Kathleen Berrin and Thomas Seligman of the San Francisco Art Museum called *Art of the Huichol Indians.*

Over these years I collected many nauseating, upper and lower bowel wrenching and ecstatically transcendent and exhausting day-long episodes of the angular geometries of visual pattern-generating DMT, the animistic breathing of bush and flower breathing peyote cactus, the darkly forbidding shadows of the psylocybin-containing mushrooms, the irreversible rocket launches into the electrically buzzing, kaleidoscopic circus of LSD-containing vials from Sandoz and the optimistic, trust engendering, expansively warm rush of six of Sacha Shulgin's gregarious, rave dancing, chlorinated, methoxylated and ethoxylated phenylethylamines which he had, years before, synthesized for "an undisclosed purpose" for the Dow Chemical Corporation under contract with the U.S. Army Chemical Corps. The best known of the latter group remains part of the *rave culture* as *Ecstasy.*

These agent's peaks are flooded with exaggerated, caricaturizing images of people's faces and a belief in the *mindedness* of animals and even the *embodiment* of inanimate things. Evoked are simultaneous and diametrically conflicting interpretations of the same social context, *heteromodal sensory fusi*on called *synesthesia* so that sound bespoke color and smells induced music, habitual thoughts rearranged as new ideas in what is experienced as exciting new insights, and, most of all, that which Louis Lewin, Berlin's early 20th Century Freud of psychotropic drugs in his book *Fantastica*, called *gladness of the soul*. Timothy Leary wrote of entheogenic escape from the habitual human brain's *mental-*

manipulative and *socio-sexual circuits* gaining access to the rapture and ecstasy brain pathways on the way to the *new planet within*.

What is seldom written about is the aftermath of chemical entheogenic agents. After the several hours of fireworks, all of these entheogenic agents, some more than others, gifted me with weeks to months of more self-sufficient, emotional fullness and ease in the conduct of living that was less contaminated by narcissistic preoccupation or defensive distantiation. I was left with increased interpersonal sensitivity and a noticeable repair of my deficiencies in aesthetic sensibility, particularly for the visual arts and landscapes. What were once two dimensional, trivial, beside-the-point, scattered copses of trees and apparently casual arrays of plant life in the Boboli Gardens behind the Palazzo Pitti in Florence, became the grandly structured, botanical wonder of increased dimension, communicating awe filled new perceptions of its previously unseen beauty. For the first time, I found myself walking slowly and stopping for several minutes, wordless, spellbound, in front of the modern art pieces of New York's Guggenheim Museum. Lost in the experience, I found myself exclaiming to no one in particular, "I can see!"

The delicacy and deliciousness of post-entheogenic agent's new and beautiful everything made me tiptoe watchfully so as not to injure an ant. Feelings of omnipersonal kindness and generous compassion were without prideful self-reflection. This state of grace felt like an invasion of a shimmering presence that made contact with my other, generally unknown to me, life. It brought new perceptions, feelings and ideas for which I was moved to give thanks. I began to think I understood a little bit about what was meant by *living in the Spirit* and *merging with God*. Mircea Eliade, the French, University of Chicago Professor of the History of Religions, in his classic *The Sacred and Profane*, calls the revelation of the sacred in ordinary objects, people and events an *hierophany.* In the state that this requires, "…all nature is capable of revealing itself as cosmic sacrality…." The entire world can become a hierophany with what Abraham Abulafia called an *activated mind*, the Jewish soul of emergent properties called the *Nefesh.*

This entirely new world, Rudolf Otto in his 1917 *Das Helige* (*The Sacred*) called it *ganz andere,* (wholly other, something else), seemed to emerge spontaneously along with an instantaneous knowing-how-it-is-with-you-and-I-and-all-of-us that made even vicious killers appear sympathetic. Is this what the Charismatic New Testament Book Churches mean by redemption through forgiveness of others, requiring the genuine sincerity of this thought before qualifying for Communion? Is this Christ's undemanding gift of grace as in *Romans 4*: where Paul observed that all of us fall short of the full glory of God unless justified freely by His grace. Was this the New Testament's spiritual technological advance from the Old Testament's and Koran's eye-for-an-eye? Did this chemically triggered transcendent experience differ significantly from the supernatural transformation of individuals by the Holy Spirit of Christian revivalist teachings? Martin Marty, University of Chicago's Professor of Modern Church History, dates the institutionalization of this personal transformation in the United States to the post-Civil War period. Did this mean that the mysteriously selfless love of Christian agape and the altruism of E.O. Wilson's sociobiology lay waiting in the brain and could appear spontaneously, by grace, without lawful directive, repetitive recitation or the discipline of catechism?

As one might have suspected, the urgency of my inner and outer search for a new spiritual ecology of mind was driven by more personal needs. My spiritual hunger was made acute a couple of years before our laboratory's DMT discovery when as a 30 year old Assistant Professor of Psychiatry and Neuroscience at UCLA in West Los Angeles, I was living in a small, heavily mortgaged house in Brentwood with my graduate student wife and two young sons. A testicular lump was an accidental discovery made while showering. After surgical biopsy and radical lymph node dissection, the professor of urology gave me a diagnosis of right testicular choriocarcinoma. All by itself, my testicle had given birth to a mass containing all the embryological tissues of a fetus, and had thrown in some maternal placental cells as lagniappe. Unlike now, when the group of testicular neoplasms are treated successfully with a high survival rate (think Lance Armstrong), at that time, follow up research of this young man's disease by the Army Medical Corps promised a five-year survival rate of only 5% to 10%. The news filled me with fear and the ensuing hopeless resignation detached me from life with a dread broken up only by episodes of rageful envy of everyone else in the world that had been spared. My wife escaped into an alcoholic flirtation with her major professor; my sons grew increasingly ensconced in the generous and kind neighborhood homes of their playmates. I metered as many hours as possible in equity growing, long lonely days in a small, dark, couch filled, university office, listening to Beverly Hills, Brentwood and West Los Angles citizens as they psychoanalyzed their mysterious lack of emotional fulfillment from materialistic fulfillment. Legend has it that Gautama's sudden insight about the universality of this sated, bored condition occurred in 528 B.C. after 49 days of sitting in the lotus position under the bodhi tree, now called *ficus religiosa.* In contrast with Buddha's illumination, my psychoanalytic training-induced, Freudian-Darwinian instinctual conflict, driven by fears of starvation and castration, drew me tighter into the world of meaningless, coin flip probabilities.

Our house was a block away from a West Los Angeles synagogue and we knew the Rabbi and his family well. Our sons played together frequently. The Rabbi tried to bring comfort to me on my death watch, with hours of discussions about trans-individual, ethnic belonging and a deeper foray into philosophical humanism. Both felt completely irrelevant to my condition. As an intern tending to those dying at night in Ochsner Foundation Hospital in New Orleans, it seemed to me that Jews tended to die more noisily than Catholics. For my personal escape from low-lying dread, I needed the metrically linear time of *chronos* to become the metric-free, topological, *continuous surface* of the *twisted circular ribbon of a Mobius loop*, with the view from each moment a *kairos*, a stretchable infinity of each moment's internal multiplicity of times.

The ruthlessly reasonable Hebraic historicity, configured by the tooth-for-a-tooth, Mosaic and Roman *talion law*, the reciprocal, economic, exchange-calculating brains of Barkow, Cosmide and Tooby's *The Adapted Mind* (*1992*) and the terrifying stories of the *Five Books of Moses*, made the hopelessness of this sinner's plight inevitable. It felt like my dichotomous choice of God-type was between One of merciless fairness and the He and She of unconditionally forgiving generosity. The mind set of logical problem solving applied to the question about which of these two represented the true character of God lead to a momentarily distracting, metaphoric ecclesial exercise: *what were the minimal number of four magical cards need we turn over with preconditions or results on the upsides and downsides if what was showing was*: (1) Beatifically good; (2) Cursed with extraordinarily bad luck; (3) Not dependent upon personal virtue; (4) Inordinately fortunate in all of life's trials. The pay-as-you-go God people would need to pick up (1) and find fortunate life and (2) to find the fate of the non-believer to establish that God was coldheartedly true and fair with the results of flipping (3) and (4) being none contributory. The grace-to-all-sinners God people need to turn over card (3) to find good life and (4) to find sometime sinners nonetheless fortunate to confirm their belief in the unconditionally of the loving generosity of God and making finding out about the underside of cards (1) and (2) unnecessary. This liturgical discussion and gamble with God's cards, perhaps a caricature of the Talmudic, rational discussions with the rabbi, felt irrelevant to my spiritual needs.

Missing was mysticism's promise of the disappearance of I into a union with the divine, the *Heart Sutra's* eternal *emptiness of form* and the *eternal form of emptiness* that gifts with spiritual perspective and not-necessarily-logical intuition about unseen *Absolute Reality*. Forced either-or, binary, card-turning cognition in the search for God's logic is unrewarding. As the Dalai Lama, in his *Heart of Wisdom Teaching*, says, "...all phenomena are emptiness, without defining characteristics, they are not born, they do not cease..." In trying to penetrate the mystery and promise of this emptiness, it was difficult to surrender my internal parody of what sounded like that day's Southern California New Age stuff about global nonaggression, sexual politics, Beadles music, distressed jeans and pot. In the synagogue of my neighborhood, experience with a deeply felt, never-you-mind-about-anything God of detachment with love, was not on the menus of Friday night or Saturday morning services. All I could feel was a faithless and nonnegotiable fear.

In the work of many mysticism-positive scholars, a classic being Evelyn Underhill's *Mysticism, 1961,* it has been speculated that this ineffable state as a union with a powerful unknown, transcending description in language, becomes more socially prominent during times of cultural efflorescence. She pointed to the flowering of mysticism in epochs of the high cultural achievements at the close of the Classical Period in the Third Century, the Medieval Period in the Fourteenth Century, the Renaissance in the Seventeenth Century and, now, as we know, in the Western World toward the end of the Twentieth Century. An increase in general acceptance of talk, writing and practice focused on mystical experience is said by many to accompany historical high points in intellectual, literary and political achievement. One might include as a component of our growing cultural richness, the new science about chemical dialogues with the brain. Although no central nervous system agents were ever allowed in the ashrams of Baba Muktananda, it was common during some evening sessions of questioning, called *satsangs,* for him to acknowledge that one or a few experiences with entheogenic agents can open many recalcitrant folks to the existence of the God within. This, in turn, led them to the drug free spiritual exercises, *sadhana*, of *love, self-truth*, and *spontaneity* (each according to their nature) as well as *abstinent discipline*, *meditation*, *chanting* and *yoga* to maintain the knowledge. We might speak of participating in the creation and maintenance of the spiritual ecology of ones inner and outer being. Underhill said that the cultural richness of an efflorescent epoch is *taken inward* and accompanies personal and societal mutations into states and institutions involving higher spiritual consciousness.

In addition to an increase in the common outward manifestations of having had a mystical experience, such as an increase in compassion, forgiveness and more respectful and reverential attitudes toward the Earth and all its creatures (currently taking the forms of *deep ecology*, *ecofeminism*, *herbal medicine*, *organic farming* and the like), these times bring more public consideration of the nature of reality itself, apart from its material manifestations. The theme of the life's work of the Dominican priest, Thomas Aquinas, made master of theology by papal dispensation in 1259, involved the existential recognition of this dichotomy of existence, *esse,* and *essence*, nature and grace, the material world and God. William James wrote famously about mystical experience penetrating the *thin veil* between these two worlds. Those with a mystical orientation attribute reality to inner experience in relationship to a transcendental, supernatural world. Whereas everyday events are subject to perceptual ambiguity and its attendant variety of interpretations, mystical union is claimed to bring the existence and meaning of *Absolute Reality* into direct experience. This kind of knowing is more akin to the *Platonic view of mathematics*, that theorems have been everlastingly existent, from before our physical world, then it is to the here and now, physically based, finite computations involving the experimental machines of physics.

The philosopher-mathematician father of *phenomenology,* Edmund Husserl, criticized the physics-want-to-be orientation of the 1860 empirical, objective measure psychologies of Fechner and Wundt. He understood the best of their findings as simply correlations between subjective and observable events. Using mathematical discoveries as examples, Husserl spent his life arguing for the possibility of abstract truths relevant to mind being more reliable and valid if grasped via direct experience. Knowing by what the popular mid-twentieth century writer of science fiction, Robert Heinlein, called *grocking it*. This is antithetical to the attitudes of today's human *cognitive and brain sciences* which disallow such knowing as deeply suspect unless accompanied by objectively definable observables such as changes in *electrical or imaging indices of brain activity* in one neural region or other. The modern psycholinguistics of brain mechanics can be called *neolocationism*. Using modern technology to measure *regional blood flow*, *energy metabolism and/or electrovoltage or magnetic field activity,* stories of function are spun that closely resemble those imagined more than a century ago by the first *locationists*, such as Ramon Cajal. These neuroanatomists spent thousands of hours looking at cell clusters and their connections in stained slides of human brain tissue using microscopes and imagined their singular and integrated function.

Today, Lewis Judd, long time chairperson of the Department of Psychiatry at UCSD in La Jolla, carries a full sized, polymeric, three-dimensional model of the human brain when teaching his students about human subjective experience and interpersonal behavior. In his weekly grand rounds, he explains that day's psychiatric patient's problems pointing here and there at regions in this plastic surrogate for our electrical jellied brain. Few, if any, of the psychiatry students in his class was inclined to ask the foundational question: how it is that a finger point and a name of a brain place can describe, much less explain in the language of physical or physiological mechanism, a patient's illogical thoughts, feelings of hopelessness, irrational rage or prayerful gratitude. There remains a wide gap between ideas about the mechanisms of human symbolic processing and those involving the structures and functions of neuronal components and their connectivities in the brain, particularly when perceived as regionally segmented meat. Yet this report of Professor Judd's finger-pointing plastic brain ritual should not elicit surprise since iconic manipulation is certainly not new to the practices of priesthood.

In contrast with neuropsychiatry's behavioral attributions to brain parts as an explanatory pantheon of mysterious doers, absent of mechanical specifics, the fields of physics turn to more abstract and general mathematical and statistical, so-called *phenomenological laws*, such as those of *thermodynamics* and *statistical mechanics*. The accounts of Feynman's abstract and general thermodynamic development of *conservation of energy* as well as *equilibrium thermodynamics* discussed previously serve as relevant examples. These abstract models have been found to capture the behavior common to diverse physical systems involving (often still unknown) differing physical mechanisms. Consistency of description, *reliability*, weighs in before predictive *validity*, which, with maturation of the research area, gradually becomes detailed mechanistic understanding with the eventual goal being derivation from the *first principles* of physics. The painful truth is that that in spite of evocative claims made to the contrary in the 1990-2000 *Decade of the Brain*, this level of understanding at the interface of neurobiological hardware and software remains unbreached. Some recent attempts are interesting.

One of the current research themes about real single neurons in real brains (in contrast with the silicon chip modules used in *neural network computer simulations*), involve widely distributed neurons that discharge in *temporal synchrony*. These phenomena have been described by Max Planck's Wolf Singer, Christoff Koch of California Institute of Technology and Florida Atlantic University's Steven Bressler and others with words such as *synchronization, phase locking, coherence* and *binding. Binding* is an intuitively seductive word that premises that two, even widely spatially separated, brain regions that manifest neuronal signals of activation locked together in time are assumed to be functionally integrated. Another time-dependent neuronal characteristic of current interest involve neurons or neuronal clusters that beat with almost strict periodicity, the *oscillatory pacemakers*. For example, the program of research by Professor Al Selverson at University of California at San Diego, among others, has elucidated the role of these *rhythmic pattern generators*, both autonomous and those emerging from particular patterns of network connections. A wide variety of functional links involving *neuronal pacemakers* has been demonstrated. They range from the *oscillatory transport of calcium* through *membrane channels* in neurons and heart muscle, *smooth muscle oscillations* of the pylorus muscle of the stomach, the neuronal ganglion driven chewing motions of the jaws of invertebrates and the retina-to-brain *hypothalamic cells* gating *human circadian rhythms* coupling our body's *hormonal clocks* to *light cycles*.

Though *regular rhythmicity in neuronal discharges* is an intuitively attractive idea and relatively easy to quantitate using simple *sine wave trigonometric transformations*, in the real brain it is statistically rare. The commonest neuronal discharge pattern observed is that of *intermittent bursting*, *clusters of neuronal discharges in time* in which the *inter-discharge intervals irregularly stretch and contract* like the bellow pleats of a syncopated accordion. Bursts of repeated firing of some unpredictable length followed by silences of equally mysterious durations. Their behavior can be represented as statistical measures using non-normal, *long tailed distributions* and *in-between entropies* described previously. For a whole human example, although the rhythm of *manic depression* is commonly thought to involve *periodic cycles*, careful study using *motility patterns* of the timing through life of these episodes of extreme mood states by Professor Allan Gottschalk at the University of Pennsylvania and others have demonstrated an irregularly *intermittent bursting pattern* in manic-depressive episodes, getting more frequent with age. Neuronal inter-discharge intervals seldom demonstrate what is called a *regression to the mean* like the *normal distribution* of heights, as one increases the number of people measured, the tighter the distribution around the mean. Neurons, much like our own irregular pattern of doing things (in spite of our plans), the statistical distributions of neuronal interspike intervals have increasingly *long tails*. Contrary to the behavior of a *normally distributed observable*, the larger the series of neuronal spike observed, the more likely that a longer interspike interval than had been seen before will occur. Counter-intuitively, long intervals tend to be followed by more long intervals as more shorts follow short intervals. Manic attacks cluster in time as does a number of other brain and body diseases. Maybe it is intuitively obvious that bad stuff tends to cause more bad stuff and good stuff is self-propagating. Having suffered recently does not mean fate owes you one. The brain's syncopated segmentations of time can be translated into a creatively arrhythmic dance.

What makes *neurologizing conversations* like these about subtle human experience possible are the human subjective scenarios we have agreed to short hand with names of brain parts and neurochemicals. The *how* is *where* conceptual connection is filled with post 19th Century Spanish microscopic neuroanatomist, Santiago Ramon y Cajal-like, intuitions about the functional role of brain structures: we think motor automaticity and pacing when hearing the brain place names such as *caudate, putamen* and *cerebellum*; we think *limbic lobe* when musing about sexuality, rage and depression; we short hand *left versus right hemispheric places* for *verbal and sequential versus intuitive and geometric shape cognition;* we point to the *frontal lobe* for the future work of *executive control, anticipation and paranoia*; the *hypothalamus* for primitively expressed *appetites* and to the *brain stem* for our *vital functions* such as *breathing* and *blood pressure*. With respect to the brain juices, we say *dopamine* for *aggressive activity*, *norepinephrine* for *attention and sensory discrimination* and *serotonin* for *hunger, mood and sexual inclination*. No matter how avant guarde our experimental techniques such as monitoring local functional blood supply by *fMRI*, *regional brain glucose utilization maps,* time-dependent changes in skull surface voltage using a cap studded with electroencephalographic, EEG, leads, monitoring these voltage field via their transverse magnetic fields by the frozen helmets of *magnetoencephalography, MEG*, we conclude our work by calling forth named but still enigmatic brain parts and their juices as mysteriously powerful little men and women executing remarkably complex and subtle tasks, sometimes even when called upon.

Current neurochemical research using molecular biological tools such as mice knockouts (the ablation of specific proteins though interference with their nucleotide-mediated protein biosynthesis), for example, the production of animals missing a subunit of their *hippocampal glutamate receptors* associated with the loss of some memory functions, conclude the memorial mechanism to be a specific cellular region, such as *hippocampal CA3 cells.* Technology advances but continues to support a primitive philosophic animism of named brain parts which pop science icons like the late Francis Crick called "The Amazing Hypothesis." He and his fellow brain philosophers implicate brain mechanisms such as the *amygdaloidal nucleus man* who can *emotionally color* even affectually neutral information that is transported through him. Imaging data showing *amygdala man* lighting up is used to tell us that circulating sensory information through the differentially behaving *amygdaloid nucleus* is used for *fight or flight* interpretive significance. Emotionally expressive human faces light up *inferior parietal cortex*. The Iowa University Professors, the husband and wife Damasios, have located even the criminal psychopath man in specific locations in the brain. As we have argued, perhaps *ad nausem*, using multimillion-dollar imaging and molecular biological technology and no new thoughts that weren't around during the era of the 19th Century's neuroanatomists, specific brain regions continue to gain implicative properties like the task-specialized gods of the Roman and Greek pantheons. Crick implied that God is a brain part.

At the same time, those of us that have been in the brain business for a while, recall skyscraper window washers, standing steady, high up on rope lashed planks, suffering from congenital absence of the *cerebellum*, the supposed *sine qua non* brain part supporting motor coordination and balance in humans. More generally, there is much evidence that if young enough and willing to work, many of the functions of missing parts of the brain can be taken on remarkably well by other brain parts thought not to be involved in these functions at all. In addition, since evidence of neuronal responding to loud noise or bright light perturbation can be found almost everywhere in the hyper-connected human brain, because anticipation and brain time inversions make *before* and *after* indicate little about human neuropsychological causality, and *inhibitory on or off* and *activating on or off* are *a priori* functionally equivalent with respect to the logic gates of information encoding, transport or storage, the modern study of brain mechanisms in emotion, cognition and behavior remains almost as mysterious as ever.

* * *

The only human mind-brain observations that are doubted consistently, and treated as unpublishable by the editors of the journals of science, are those that result from direct human experience using subjective reports from within. They are called unscientific. Often ignored are logically consistent mathematical and computational contexts, which, as abstract and general tools of thinking and imagining, have the capacity to frame, rigorously define and describe thinking about both the subjective and objective aspects of brain-generated phenomena. These mathematically configured metaphors can lead to consistencies in description, *this is behaving like that*, in what are called *equivalence relations* expressed both as intuitive imagery; for a concrete example, a one holed bagel and one handled tea cup are *topologically equivalent* because, sculpting in clay, they can be smoothly transformed into each other. We have seen that *invariant measures* in computable statistical flows can come out of a mess of data. Professor Paul Rapp of the University of Pennsylvania has been able to mathematically encode the verbal content of the patient's free associations and the therapist's responses, using tape recordings of hours of psychoanalytical treatment. Examples of quantifiable qualities found useful in this regard involve a variety of characteristic statistical patterns in what are called *entropies* and *information* as well as various measures of what with a wide range of definitions is called *complexity.* These quantifiable properties, *measures*, can help in the struggle with the intrinsic tension of Absolute Reality between the "eternal emptiness of form and the eternal form of emptiness." We resort to measures of *entropy*, *information* and *complexity* when confronted with our ignorance, "emptiness," great or little, with respect to either cause or result, about what exactly is going on. *Entropy* in its forms relevant to information quantifies our ignorance, the emptiness and its mystery. Computations of the entropy of systems in motion convert questions and answers concerning the detailed workings of the leg's neuromuscular machinery to global statistical descriptions of more abstract thematic motifs, *forms*, expressed in the dance. Patterns of behavior of these properties can suggest intuitive ideas and imagery about global mechanisms, *approach/avoid*, *smooth/discrete*, *wild/tame*, as well as correlated and objective physical observables.

To learn more about this abstract, topology tinged (none numeric) style of model building, we can go to school on a long studied physical example. It connects a simple and well understood *real world observable* with *abstract statistical patterns* resulting from motions using the *one-to-one correspondence* (the *equivalence relation* called *isomorphism*) between their *entropies*. As we have discussed, the Stanford mathematician and Field's Medal Winner, Donald Ornstein, proved that in statistical studies of even *point-to-point unpredictable*, *chaotic systems*, *entropy is the only isomorphism*. The *hardware* of this physical example is what the statistical physicists call a dilute gas of some fixed number, *n*, of uniform hard spheres, *moving scatterers*, that, absent of *dissipative friction*, wander continuously around, changing their directions when bumping into each other. In a two dimensional bounded arena of randomly rolling balls, this game has been called *Sinai's billiards*. It was named for previously mentioned Ya Sinai, an eminent Russian mathematician He is now at Princeton and was previously a student of Andrei Nikolaevic Kolmogorov, the Russian guru of many of the Twentieth Century's world-class Russian mathematicians. Kolmogorov axiomatized the field of probability and, more relevantly, initiated the theory of *statistical descriptions*, the *ergodic theory*, of *nonlinear dynamical systems*. In the language of *statistical physics*, we will see that the same system produced by high number of elements executing Newton's deterministic laws can be generated by a so-called random system such as that resulting from flipping a suitably biased coin. Our example can also serve as a metaphor, used extensively in the mathematical biology of the late Professor Art Winfree, for the *temporal features of life on a topological circle*: the natural irregularities of the recurrent beat of the heart, the in and out breathing of lungs, the up and down voltage of brain waves, the pendulum swings of our blood hormone levels, the cyclic procession of our days, months and years and at large scale, our body’s journey from dust to dust.

The angular deviation theta, θ from the initial reference direction of a single moving sphere, gets rotated to a new angle theta, $\theta \rightarrow \theta'$ by a collision with another sphere. It has been shown that the new angle θ' is the previous angle, times twice the average distance traveled between collisions called *the mean free path*, here symbolized by delta, δ, divided by the diameter, *D*, of the sphere. Algebraically, $\theta' = \frac{2\delta}{D}\theta$ the new angle is equal to twice the *mean free path* divided by the diameter of the spheres times the original directional angle of the sphere’s motion. If we symbolize the time between collisions with tau, τ, after an elapsed time of experimental observation, *t*, we can say that the deviations from the initial direction of the sphere changes like $(\frac{2\delta}{D}^{t/\tau}$. The exponent, t/τ, represents the time of the experimental observation divided by the average time between collisions of the spheres, i.e. the time we’ve been watching, *t*, is expressed as units of inter-collision interval, τ. Of course, the circular deviation in the angle from the initial direction rotates repeatedly around a circle as the number of collisions increase. If a point on a circle marks the angular change resulting from each collision and the system runs long enough, it has been shown that the circle will eventually be completely covered by points.

An *estimate of the entropy*, *S*, being generated by each sphere labeled with some index *i, Si,* is positive because the recurrent motion is deviating continuously from the initial direction. It can be computed for each sphere as the *logarithm of the intercollision time-averaged deviation from the initial direction*, $S_i = \frac{1}{\tau}\log(\frac{2\delta}{D})$ and the *entropy* of the whole n hard sphere system is the sum of the *n* entropies, which can be expressed as $n \times S_i$. If we keep books by registering the points when each sphere’s $'$ makes a stop on the top half of the sphere’s circle as 1 and the bottom half as 0 (and we must arbitrarily decide between 0 and 1 if it falls exactly on the division between top and bottom and do so in a consistent way), then we can keep score with a random looking binary series such as 11001001010.... that describes the sequence of rotations. The advantage that accrues by doing so is that this *coin flip counting* eliminates details in favor of a *computable over all measure* and supports several forms of *entropy calculations* for its use in deciding if *this system is behaving like that system*, an *equivalence relation*. One can imagine a series of coin flips with 1 being heads and 0 being tails such that the statistics of a characteristic series is determined by the *fairness* of the coin. As noted above, Donald Ornstein's famous theorem says that the entropy of these kinds of hardware and software systems is the only general basis for finding correspondence between characterizations of two such *irregularly behaving systems*. The important idea here is that a series of 1's and 0's may not be identical but the two systems can be *isomorphically equivalent with respect to their entropy.*

Notice again that the physical process of hard spheres bouncing off each other on a flat surface has been captured by an abstract representation in *binary numbers* that, like a series of coin flips, can be quantified as entropies (which would be maximal for an ideal, fair coin). After describing the process of real number representation by the binary code, we will show *how entropies can be computed for these binary series*. We remind ourselves that we are struggling to obtain some kind of knowing in a representative system manifesting the *tension and mystery between emptiness and form.*

We can translate all finite real numbers into this language, making them accessible to standard entropy computations. The following discussion of the process of *transforming numbers into binary series* is in the spirit of the famous number theory theorem that every *natural number* (the *positive integers* such as 1, 2, 3, 4…) can be expressed as the sum of at most four squared numbers. Encoding any number by a series of 0's or 1's in what is called a *binary transformation*, begins with its separation, called *partition*, into a sum of powers of 2, for example, 100 = 64 (2^6) + 32 (2^5) + 4 (2^2). A short hand description of this sum begins with a form indicating the presence or absence of each successive power by a 1 or 0 coming before the relevant power of two; i.e. $100 = 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 0 \times 2^3 + 1 \times$

$2^2 + 0 \times 2^1 + 0 \times 2^0$ (in which the last term, arbitrarily, is $2^0 = 1$, since anything to the power 0 = 1). This can be written even more simply as a series of 0's or 1's, their presence indicating whether the power represented by each place in the left to right descending sequence of powers of two participates in the sum of the partition. It is in this way that in binary numbers, 100 = 110010. As another example, if we similarly partition the decimal number 729 = 512 (2^9) + 128 (2^7) + 64 (2^6) + 16 (2^4) + 8 (2^3) + 1(2^0), we find that its binary transformation results in 729 = 1011011001, the 0's representing the descending powers of two that are absent in the powers of two partition. One can compute the binary representations of lower valued numbers immediately; for example, $4 = 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$ so that there is a 1 in the multiply-the-power-of- two column and 0 the power 1 and power 0 columns so in binary representation, 4 = 100. Similarly, $6 = 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$ making the binary transformation of 6 = 110.

It was the co-inventor (with Isaac Newton) of the calculus, Gottfried Wilhelm Leibniz, in about 1665, who fully developed the *binary representation of all decimal numbers.* In a state of wonderment about the simplicity, power and completeness of this 1 and 0 encoding, he is said to have the beliefs that 0 symbolized the emptiness of the universe's beginnings, 1 represented the complete fullness of God and that this transformation served as metaphoric evidence consistent with God's creation of the universe out of nothing.

The simplicity of binary expressions as in the dynamics of hard spheres or rotations on the circle as well as the transformations such as 729 = 1011011001 make them propitious for exemplifying the methods for computing the *entropies of the growth rate of the possible, called the topological entropy*, H_T, and the *probable, the metric entropy,* H_M, which was introduced in a previous chapter called "Sensual In-Between Entropies." The following exemplify the computations of measures of *topological and metric entropies*, H_T and H_M, another computable idea called *algorithmic complexity*, *AC* and finally, the well known (to statisticians) *standard run score, src*. Their descriptions *have* as their purpose a demonstration for the reader that these apparently abstract, perhaps nebulous sounding, words can be transformed into well-defined, concrete, quantitative and computable form of reality.

If acceptance of this idea does not constitute a problem for the reader (and you do not find it fun to follow along with a computer math program and/or a pencil), then the following several paragraphs can be quickly scanned or skipped entirely.

The computations of H_T and H_M begins with keeping track of how many 0 → 1 and 1 → 0 transitions are found going from left to right in the binary series. For example, in the binary expression of 729, 1011011001, one starts counting with a 1→ 0 transition followed by a 0 → 1 transition and then a 1 → 1 transition and so on. A useful way to record the count is via entries into a 2 × 2 matrix for score keeping in which the horizontal rows are labeled 0 on top and 1 below and the vertical columns are labeled 0 on the left and 1 on the right. The number of each kind of transitions (from the vertical label to the horizontal label) are counted and summed in the appropriate box of the two box by two box matrix; for examples: for a 0 → 0 transition, a tally mark is entered in the upper left corner of the matrix; for a 0 →1 transition, a tally mark is entered in the upper right corner; a 1→ 0 tally goes in the left lower corner and a 1→ 1 is tallied in the right lower corner. The resulting transition incidence counting matrix, M_t for the 729 binary transformation series looks like $M_t = \begin{matrix} 1 & 3 \\ 3 & 2 \end{matrix}$ indicating one 0 → 0, three 0 → 1, three 1 → 0, and two 1 → 1 transitions have been tallied. Although this series alone is too short for computing reliable statistical measures, if we assume that the pattern of transitions observed in this short series is stationary, that is its transition behavior will remain the same if the binary series continued on to be infinite in length, the *assumption being that the dynamics of now will be the same as always*, 729 will stay 729, then we can use two forms of this transition matrix in the computation of the *topological entropy* reflecting the *growth rate of the possible*, H_T, and the *metric entropy* from the *statistical weights of allowed choices among them, the probable*, H_M.

To obtain the entropy representing the *growth rate over time of the new possibles*, the computation of H_T, the *topological* entropy, involves first transforming M_t into an *transition incidence matrix*, $M_{t,i}$ a 0 or 1 matrix indicating whether each box has been entered at all (or not). Since in the binary representation of 729, all four boxes of M_t are occupied, the $M_{t,i}$ = $\begin{matrix} 1 & 1 \\ 1 & 1 \end{matrix}$ indicates that all four kinds of transitions are possible. Since we remain in the context of a 0,1, two state system, the growth rate of the possible equals the logarithm, base two, of the sum of the entries in the boxes of the left-top-row to right-bottom-row diagonal called the *trace* and $H_T = \log_2 (1 + 1) = \log_2(2) = 1$. Consistent with intuition, since every transition is possible, the topological entropy of M_t as indicated in its $M_{t,i}$ is maximal (= 1). Another expression equal to the *sum of the trace* (the sum of the upper left to lower right diagonal) in a square matrix, is its leading *eigenvalue*, most often symbolized with a lambda, λ_1. *The logarithm of the leading eigenvalue of the transition incidence matrix is equal to its topological entropy.* Symbolically, $H_T (M_{t,i}) = \log_2 (\lambda_1) = \log_2 (2) = 1$. Standard elementary linear algebra texts describe how to compute eigenvalues, these relations and related operations as well as their foundational theorems.

Before computing the entropy of the distribution of probabilities among the possibles as the *metric entropy*, H_M, let us notice again that the occupancies in the four entry boxes of the transition matrix M_t are not uniform, M_t = $\begin{matrix} 1 & 3 \\ 3 & 2 \end{matrix}$. This leads naturally to the intuition that for this series of binary transitions, H_M, in contrast with H_T, will not be maximal, i.e. not equal to 1 and the nonuniformity of H_T and H_M is a computational expression of what we mean by a state of *in-between entropy.* These entropies are identical and their difference = 0 for transitions reflecting maximal entropy, as might be realized in a very long series of fair coin flips in which the entropies = 1. Entropy will be minimal when flipping a two headed coin, here the entropies = 0. More compactly, the *non-uniform probabilistic, metric entropy, differing from the maximal topological entropy* indicates that the system is in a dynamical state of *in-between entropy*, written as $H_T - H_M \neq 0$.

In the computation of the metric entropy, H_M, the M_t is transformed into a transition probability matrix, $M_{t,p}$, called a *Markov matrix* named for one of the two great Russian mathematicians, both students of Pafnuti Lvovich Chebyshev, the Markov brothers. The entries of each row in the M_t are transformed into transition probabilities, so that the sum of the decimal fraction parts of all the boxes in each horizontal row add up to 100%, or as a real number, 1.00. Recall that in the example we've been using, the binary expansion of the natural number 729, the transition incidence matrix is $M_t = \begin{matrix} 1 & 3 \\ 3 & 2 \end{matrix}$ and its Markov matrix is top row, 1/4, 3/4 and bottom row 3/5 , 2/5, i.e. $M_{t,p} = \begin{matrix} 0.25 & 0.75 \\ 0.60 & 0.40 \end{matrix}$. *Matrix multiplication* of $M_{t,p}$ by itself repeatedly is equivalent to tracking the temporal evolution of the transition matrix's probabilities until the resulting matrices move toward, *converge onto,* a steady state; each self matrix multiplication step represents what results from the passage of one unit of time. The convergence to equilibrium values is continuous and gradual. When the steady state is reached, *both rows become identical*. For this example, $M_{t,p} \times M_{t,p}$ or $M_{t,p}{}^2 = \begin{matrix} 0.5125 & 0.4875 \\ 0.3900 & 0.6100 \end{matrix}$; $M_{t,p}{}^4 = \begin{matrix} 0.4527 & 0.5472 \\ 0.4377 & 0.5622 \end{matrix}$; $M_{t,p}{}^8 = \begin{matrix} 0.4445 & 0.5554 \\ 0.4443 & 0.5556 \end{matrix}$; $M_{t,p}{}^{16} = \begin{matrix} 0.4444 & 0.5555 \\ 0.4444 & 0.5555 \end{matrix}$ which for the first four decimal places remain the same for additional times of self multiplication. Note the convergence of the top and bottom rows to the same asymptotic values. Books discussing the multiplicative and other behavior of these *nonnegative matrices* are numerous and frequently appear in matrix algebra texts under the rubric of the *Frobenius-Perron theorems*.

Using the entropy formalism of Claude Shannon as developed previously, H_M is computed as the sum across either of the identical rows of each probability times its logarithm, $\rho_1 \times log(\rho_1 \rho_2 \times log(\rho_2))$ remembering from above that we are working in base 2 logarithms and to change the minus sign (resulting from taking the logarithms of decimal fractions) to plus: H_M ($M_{t,p}$) = .4444 × *log*(.4444) + .5555 × *log*(.5555) = .9911 The *nonuniformity* of the box occupancy probabilities is reflected in *the difference between the topological (maximal estimate) and metric (minimal estimate) entropies* and is therefore quantifiable and computable: $H_T - H_M \neq 0 = 1.00 - 0.9911 = 0.0089$. If the maximal and minimal estimates of the entropy were equal and all the probabilities boxes in each row asymptotically contained the same probabilities as in M_t = $\begin{matrix} 0.5 & 0.5 \\ 0.5 & 0.5 \end{matrix}$, it would retain these values across an infinite number of self multiplications such that H_M = .5 × *log*(.5) + .5 × *log*(.5) = 1 and H_T - H_M = 1.00 – 1.00 = 0. 0.

Complexity is a more general and variously defined descriptive expression than that of the topological and metric entropies and as such brings with it many kinds of definitions and computational approaches. One choice that's intuitively appealing assumes that the relative complexity of an expression representing, say an outcome of an observation or experiment, is reflected in the *minimum length of the most compressed program* (*algorithm*) from which, given a suitable *dictionary of symbolic equivalencies*, one can reconstitute the original expression. Increases in what some have called *algorithmic complexity, AC,* are reflected in the growth of this minimally descriptive symbol series length. Karen Selz's approach to compression and *AC*, similar to one proposed by Paul Rapp, involves the identification and symbolic representation of repeated blocks of symbols called *words.* For example, given an arbitrary, exemplifying binary series: 011011101010001010101001001010011, we first find the longest repeated word [1010100] and represent it with the symbol, *a*, yielding a shortening in the original series, 011011*a*010*a*1010011. The next longest repeated word is [011] is replaced with *b*, yielding a further compression, *bba*010*a*1010b. The next remaining binary word is of length equal to the previous one, [010], which, when replaced by *c* results in the series *bbaca*1*cb*. This can be further compressed to the final representation with four symbols and for the sequentially repeated *b*, one exponent of degree two, $b^2aca1cb$. From this representation and a dictionary of letter equivalent words, the original binary expression can be recovered. For a quantitative index of the *algorithmic complexity, AC,* of the compression, Selz computes the sum of the number of distinct symbols plus the sum of the natural logarithms of the exponents: 4 + log (2) = 4.6931. The binary representation of 729, 1011011001, discussed above, is compressed by making two [101]'s = *a* and two 0's = *b* resulting in $a^2 1 b^2 1$. Having three distinct symbols, *a*,*b*, and 1, and two exponents of two, its algorithmic complexity is equal to, *AC* = 3 + 2 × log(2) = 4.38.

In addition to H_T, H_M and *AC*, if computable in a meaningful way, the *deviation of the binary series under study from the idealized random behavior of a fair coin* could serve as another index of complexity. Common descriptions of the amount of randomness in a series are indices of *run length* If a *run length* is defined by number of elements in a series of the same symbol before it stops, counting the *number of run boundaries* by reading along the binary series and counting the *number of switches* from 0 →1 or 1 → 0, then the binary expression of 729, 1011011001, has six runs. The great analytic probabilist, William Feller, among many others, including the distinguished 18th Century Swiss family of mathematicians, the Bernoulli's, proved that computing a *standard run score*, *srs*, involves three terms, the theoretical expectation, *E*, of the number of runs, *r*, that is *E*(*r*), the number of runs actually observed, *Obs*(*r*) and the variance of the expectation of the number of runs, *Var*(*E*(*r*). If the *srs is less than zero*, *then the binary series is more random than that resulting from the flipping of a fair coin*. Interestingly, when a normal group of subjects are instructed to simulate what they think of as a random coin flip determined series of 0's and 1's, their *srs* tends to be lower than zero, over-estimating the degree of irregularity that randomness represents. Long runs occur by chance far more often than intuition would dictate. If *srs is more than zero*, than the binary, coin-flip series is *more ordered than random*. If *srs* equal to zero, the binary series is not discriminable from fair coin flipping randomness.

The expected number of runs, *E*(*r*), can be estimated by a fraction formed by twice the product of the number of heads times tails divided by the sum of the heads and tails to which is added one. That is, *E*(*r*) = $\frac{2\times 6\times 4}{6+4}+1=5.8$. The average variation around this expectation called the *variance*, *Var*, of the expectation, *Var*(*E*(*r*)), is estimated by a fraction formed by (take a breath) twice the product of the number of heads times tails × twice the product of the number of heads times tails minus the number of heads and minus the number of tails, all over the product of the sum of the heads and tails squared, times the sum of the number of heads and tails minus one. That is, $Var(E(r))$ = $\frac{(2\times 6\times 4)(2\times 6\times 4-6-4)}{(6+4)^2\times(6+4-1)}=2.03$. From these three terms, we compute *srs* = $\frac{E(r)-Obs(r)}{\sqrt{Var(E(r)}}=\frac{5.8-6,0}{\sqrt{2.03}}=-0.140$. We conclude that the *standard run score* of the binary series is less than zero and therefore more random than the expected random behavior of a fair coin.

Recall from the last chapter that Karen Selz, Martin Paulus and others have shown that various personality types and psychiatric diagnoses are associated with characteristic deviations of *srs* from zero. When the winners of the 2002 Annual World Rock, Paper Scissors Championships held in Montreal Canada were interviewed, they said that sensing their opponent's characteristic style of deviations from randomness in what we would call the continuum from maximal to minimal entropy determined their successes. We characteristically use all of these measures to estimate quantitate the deviation from randomness *standard run score, srs*, *algorithmic complexity, AC,* as well as H_T and $H_{M,}$, the *topological* and *metric entropies*.

* * *

The encounter with mystical Absolute Reality, though sought by arduous contemplative and other practice, emerges spontaneously, most often during times of apparent mental emptiness, detachment, a state in which rationally instructive thought and the choral background of brain voiced, emotion-ladened, commentary have disappeared into the entropic soup of formless silence. It is this indescribable, ineffable, stillness that we think serves as the psychophysiological anlage of mystical experience. The mathematical systems yielding quantitative metaphors, descriptive ideas about dynamical entropic statistical emptiness and form inspire the use of mathematical structures in place of localized lumps in brain meat as personalized icons of doing.

Our wedding of well-defined mathematical objects to metaphoric elements of more general nonverbal intuition has a long tradition. Rene Thom's 1990 book, *Semiophysics,* discusses mathematical mechanisms and their representations in mind and the real world, analogizing mathematical objects and the intuitions they generate to *mechanical tools.* Similar ideas are found among the *four liberal arts of the ancients: Number, Geometry, Music and Cosmology.* The epistemologies of all four require, then and now, the intuitive use of mathematical objects, conscious or unconscious. Examples can be found in conceptual issues of Geometry and Number with implications for relationships between man's physical and psychological worlds. One set of articulations were attributed to the *shapes of Platonic solids* found among the Neolithic stone circles in Aberdeenshire, Scotland, 2000 years before Plato. Each symbolized particular physical and psychological themes. All manifested equal edges and every face of each solid was the same perfect polygon. The solid with four equilateral triangles manifesting four vertices and faces, the *tetrahedron*, represented the physical element, *Fire*, and the personal psychological climate of a choleric, fiery nature. A Platonic solid composed of eight equilateral triangular faces, two tetrahedrons annealed, the *octahedron,* signified *Air* in physical composition and optimistic hopefulness in psychological disposition. Six square faces together making a *cube*, evoked the elemental physical component, *Earth*, and its human expression as a phlegmatic, apathetic personal style. Twenty faces, all equilateral triangles, constitute an *icosahedron* indicating *Water* and a dominant feeling state of melancholic sadness. Like onomatopoeic words and pictorial script, the three dimensional geometry of *these Platonic solids feel like what they came to symbolize.*

The personality styles symbolized and evoked by the Platonic solids continue to be used to this day. For example, they compose the basic elements of the constitutional categories of remedy in homeopathic medicine as introduced over 200 years ago by Dr. Samuel Hahnemann in his classical *Organon of the Medical Art.* The assignment of clinical remedy in homeopathic treatment combines consideration of the presenting physical symptoms and signs, the *what*, with intuitive discernment of the patient's constitutional type, the *who.* To the homeopathic physician, *tetrahedral fire* is suggested by the traits of personal magnetism, courage and inspiration as well as egotism, strong desire and rage.

Octahedral Air people intellectualize objectively in confident and insensitive aloofness. Those symbolized by *cubic Earth* are realistic and practical, a what-you-see-is-what-there-is belief along with rigid, materialistic ways. *Icosahedral Water* types experience emotions strongly and are sensitive, intuitive, nurturing and can be overly sensitive and dependent.

What intuitions and observations relevant to self, subjective and objective, emanate from the stylistic properties of feelings as derived from a time series of observations of their associated actions suggested by their statistical measures, H_T, H_M, *AC* and *srs*? The yield is rich and unexpected. We find an enjoining of values of these measures, characteristic and invariant for each person, with the brain and behavioral actions of entheogenic agents and Zen meditation in contrast with worldlier focused attitude adjusting experiences and drugs. The range of their potential values helps rationalize a person's inclinations along the continuum of *attachment* and *detachment.* This quantifiable dimension augers positively and negatively with respect to the requirements for mystical experience as poetically described by the ambivalent warrior prince, Ardjuna, in conversations with Lord Krishna in the *Bhagavad-Gita*, the most famous and influential component of the *Mahabharata* of Hindu scripture, A similar theme relevant to the occupancy of a propitious range of values for the measures, H_T, H_M, *AC* and *srs,* is found in what is often called the *Second Nobel Truth* as explained by the Buddha, Siddhartha Gautama, in lectures recorded in a deer park near Benares. We begin with the results of some drug experiments conducted by behavioral neurophysiologists and end with suggestions about the intuitive relevance of the conceptual content of these measures to the *universals of mystical experience* and perhaps to elements of *spiritual transformation.*

As described previously, the brain and behavioral process of *habituation* is characterized by a decrease in the strength of an observable response to the repetition of an evocative stimulus. Imagine the decrease in our startle responding when a once unexpected loud noise continues to occur. Sir Charles Sherrington, the early Twentieth Century British pioneer in neurophysiology showed that animals and humans gradually stopped the withdrawal of their limbs with stimulation of its skin when it was repeated several times. Columbia University's Nobelist in the brain sciences, Eric Kandel studied the neural mechanisms of *habituation* as a *primitive, accessible and fundamental example of learning,* the association of a nonresponse to a usually evocative stimulus, in *Aplysia californica.* The *sea snails* learned not to respond to a local irritation with a *gill-withdrawal response* when exposed to it many times. They learned to stop paying attention to the perturbation. The background noise appears to disappear after a little time in the Mall. Though his exploration of its synaptic mechanisms involved the neural circuit of the gill-withdrawal reflex in the marine snail, its generality and human relevance is well established. Hundreds of papers can be found reporting the results of studies of habituation in normal humans under all kinds of circumstances as well as in psychopathological conditions. That it samples something both fundamental and persistent is suggested by studies in children by one of Kandel's students, Michael Lewis. He found that the *rate of habituation of a startle response* to a bright light in one-year-old human infants predicted success in many kinds of learning and other cognitive functions when the children were tested again at the age of four. Pavlov's experiments studied habituation of the classically conditioned salivary response to meat powder-coupled bell sounds in dogs in which the bell was followed by nothing, not only led to inhibition of the salivary response with unreinforced trial repetition but generalization of the inhibitory state such that dogs were observed to freeze in motionless catatonic states for hours. In the language of our statistical measures, the fixation of the dog's behavior would manifest minimal entropy in the form of $H_T = H_{\mathrm{M}} = 0$ and the lowest complexity values for *AC* and *srs.* Entheogenic agents like *LSD* or *mescaline* inhibit the process of habituation and fixation, maximizing the entropy of behavioral measures, H_T, $H_{\mathrm{M}} \rightarrow 1$ and high complexity values for *AC* and *srs.*

Mark Geyer and David Braff, Professors at the University of California in La Jolla and Michael Davis, a Professor at Yale's School of Medicine, found that entheogenic agents, such as mescaline and LSD, as well as naturally occurring indoleamines, such as DMT, which occurs naturally in human brain, *prevented habituation of startle responding* in mammals. Each sound repetition was treated as though it were new. *The baby is Buddha* is an Eastern philosophical aphorism that captures the fresh spiritual state of each moment's openness and readiness, the *in-between entropies* for new information surprise. Geyer and Martin Paulus found that entheogenic agents such as *Ecstasy* also increased the *complexity* of the patterns of *spontaneous motor movement* made by rats exploring a bounded space. Recall that they partitioned the floor to document the exploratory motion in the context of a sequence of location transitions, readying the data for the computation of some of the measures previously described. Following the administration of entheogenic agents, the partitioning of the space that the animals were exploring, into a lattice of discrete boxes and the encoding of each square with a symbol, the computable entropic and complexity measures such as H_T, H_{M}, *AC* and *srs* were increased. In contrast, the administration of amphetamine-like stimulants led to a different kind of behavioral activation than that induced by entheogenic agents. The measures of H_T, H_{M}, *AC* and *srs* reflected decreases in entropy and complexity. As University of California's David Segal and others documented in the 1960's, high doses of amphetamine led to animals into in a minimal entropic state, they were frozen in stereotyped rocking, nodding and circling motions. High dose amphetamine-treated humans develop rigid fixation of ideas, low H_T, H_{M}, *AC* and *srs*, in man this is seen as inescapable obsession and paranoid delusion. There is considerable medical evidence that Hitler took large doses of amphetamine (Benzedrine) daily for the last 20 years of his life.

The entheogenic drug-induced phenomena of naïve openness and absence of fixation, states of high entropy and complexity, behavior generating higher than control measures tending toward maximal values of H_T, H_{M}, *AC* and *srs* , are subjectively reflected in the results of personal experiments of University of Chicago's Heinrich Kluver as described in his *Mescal and Mechanisms of Hallucinations* (1966). Observing himself after the self administration of a crude preparation of *peyote cactus,* he said that it led to *glad feelings of unfamiliarity* and a *marked reduction in his tendency for boredom* (*habituation*), a detachment from old ways of thinking and a new openness to a rush of *seen again for the first time* experiences. Everything in his personal world, no matter how mundane, became a source of new interest and fascination. New thoughts replaced old ideas in a continuing process of new formulation. All of these things feel like they emerge spontaneously, *making ideas about being born again and personal renewal concrete.* We remember that Timothy Leary and his wife in their privately circulated pamphlet, *Neurologic*, described their entheogenic drug-induced escape from the habitual order as supported by the learned and established "…mental-manipulative and socio-sexual brain circuits…," an escape to a fresh new planet of possibilities. Louis Lewin, the early Twentieth Century German pioneering ethnopharmacologist described his subjective responses to *peyote* as a flood of lively, numerous, random fantastic creations of perception and thought, all demanding his fresh attention.

To complement these subjective reports, experimental tasks involving habituation, such as the disappearance of a brain wave sign of arousal to sound or light stimulation, called *alpha blocking,* the eyes-closed resting pattern of 8-14 cycles per second, *hz,* waves perturbed into the arousal pattern of >20 *hz*, did not habituate when the subjects were pretreated with *entheogenic drugs*. This finding was also true for the results of years of meditative practice. In his 1974 *Psychophysiology of Zen*, Hirai reported that Soto Zen monks, after many years of practice in mindful, one pointed, *be here now meditation*, unlike normal controls, continued to show *alpha blocking surprise*, *brain wave arousal patterns,* throughout the course of repeated stimulation with auditory clicks.

James Austin in his monumental book, *Zen and the Brain* (2000) summarizes other studies of habituation in TM practitioners and other mediators in which eyes open versus eyes closed, the set and setting and variations in other experimental variables blurred these results to some degree. He develops the case that years of meditation-induced brain states of emptiness, we would say of maximal entropy and minimal form, set the stage for the ecstatically insightful flood accompanying the sudden insight into a *Zen koan's* solution or the transcendent startle induced by a *roshi's shout.* A meditative struggle concerns how one can think about not thinking. That is, thinking of nothing. This is generally thought to be the most important part of Zen meditation, called *zazen*. Achieving high values for brain and behavioral H_T, H_M, *AC* and *srs* supply the formless infrastructure for ecstatic transformation.

In healthy people, an awareness of self is not lost during *this time of invasion by and fusion with what feels like an independent agency.* At full force, the mystical experience is transfixing, tending to paralyze movement and speech, and at the same time bringing with it the capacity for clear sensory and sensory-integrative lucidity. This new seeing *brings previously unnoticed things to attention and makes old things new*. Perhaps most striking is the passive (unsought) experience of the *unification of erstwhile disparate*, apparently unrelated thoughts and feelings. The yield can be the sudden emergence of deep relationships between apparently very different constructs, beliefs and formalisms leading to unanticipated and unsought integrative connections. In mathematics, this experience can lead to entirely new kinds of theorems and proofs; in the physical and biological sciences, a previously unseen organization of the data generating new global relationships and potential scientific laws. In our spiritual life, the ineffable richness of the direct experience of God.

Mysticism-negative interpretations of these experiences have always been attendant. To the extent that the mystic's inward turn is seen as a detachment and implicit derogation of the *external, consensually real world*, it is often seen as alienating from established institutions of religion and government. Psychoanalytic practitioners may label it a *regression to primary narcissism*. Most churches tend to discourage its practice as counter to the dominant social hierarchy and its governance. Governments pass laws against its practice and manifestations, a current example being modern Chinese governmental reactions to the *Tibetan Buddhism of the Dalai Lama* and the *yogic practices of the Falon Gong.* Agencies of established society such as the institutions of licensed medical practice make the dominance of the inner world of mysticism subject to diagnoses ranging from the *narcissistic character disorders* to interpretations of the reported extraordinary experiences as manifestations of *schizophrenia*, *manic-depressive disorder* or *temporal lobe epilepsy*. Rejection and fear of the transcendent states lead to uninformed and politicized anti-narcotic laws, grouping heroine and cocaine with the *entheogenic* (recall: *engendering connection with the sacred within*) agents such as the *Huichol Indian's peyote* and the *Amazonian Indian's yage,* obstruct and socially taint the personal use of plants and practices that facilitate access to the *mystic way*. Rational, socially responsible and otherwise kind and tolerant Presbyterians, Unitarians and Reformed Jews can be suspicious and rejecting of what appears to them as the politically tinged *mass hysteria of praying in tongues* and other rituals of Charismatic Christian rebirth and renewal or the ecstatic states of Orthodox Jewish chant-dancing.

Modern brain and behavioral scientists, remaining under the philosophical spell of *logical positivism* and its requirement for operational definitions and (external) *experimental disconfirmability*, operate from the position of strong doubt when mystical experience is addressed. What is striking and strange about how science plays the game of mysticism research is exemplified by the publishable increment in credibility concerning a meditation-induced change in state of consciousness when Boston University's William Benson reported the accompanying *relaxation response*, a sudden decrease in heart rate---much like the *dive reflex of a seal* or what the heart rate does when you duck your head suddenly forward into a sink full of water. Decades are spent getting professorial tenure for research yielding things we have already experienced and know directly and for ourselves. Recall that the existence of visual imagery in the human, doubted by an experimental psychology of the time in which William James self-exploratory observations were viewed as revolutionary, was made more credible by evidence for the existence of a *subjective spatial metric*: verbally reporting subjects, when timed, took longer in their minds to go from one room to another one that was down the hall then going to the room that was immediately next door.

We use brain chemical, pharmacological, neurophysiological and neuroanatomical localization and computation of characteristic statistical patterns in time dependent brain and behavioral observations to the same end.

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CHAPTER 6:

PENTECOSTAL PHASE TRANSITIONS

By their late teens, my two offspring, sons of an Alcohol Anonymous, born again, originally Christian Science mother and a spiritually struggling and mostly secular Jewish psychiatrist father, had been unfulfilled in their hungry search for the experience of a personally meaningful God. After years of perhaps too academic conversations with their parents, visits to a variety of houses of worship, talks with University of California religion professors and evenings with a Ph.D. psychologist-rabbi and friends at the neighborhood synagogue, they turned somewhere else. Some of their high school friends who were Evangelical Christians took them to their Assembly of God, Pentecostal and other Christian, direct experience of God, churches. They came to love what they sometimes called their Wednesday night and Sunday morning “rock and roll,” services.

Struggling with the post-Vietnam cynical mistrust of authority and the marijuana apathetic nihilism of the 60’s and 70’s, and clearly not enticed by what they regarded as their father’s vacuous mélange of New Age Eastern Religions and secular brain science, they spoke about their sudden and life-changing experiences. They studied, memorized and quoted the Scriptures as part of their commitment to their *word churches*. As erstwhile cynical teenagers, now positive and brimming with faith, I secretly called it denial, they described what was happening to them as New

Birth. They told me that, paraphrasing Paul in Romans, they had been saved and were living New Life, not earned by good works as in Hebraic Law, but by faith through God's Grace. Jesus had "paid their bills" through His sacrifice at Gethsemane. They both tried to explain inexplicable feelings of new energy, the unseen hand of spiritual guidance and peace. One told me that the wind of the Holy Ghost had taken him to the front of the pulpit, tearfully, thankfully, on his knees, to accept Jesus as his personal Savior. They described how they had opened their lives to the spiritual strength of *living in Jesus*.

Many things about them changed: their tastes in food, from hamburgers to vegetables and fruit; from the jazz of John Coltrane and McCoy Tyner and the cynicism of Frank Zappa's "…only fourteen and knows how to nasty…," to playing strum guitar and singing the hymns of Wednesday night healing services; from t-shirts hanging out of raggedy, Southern California, boutique store purchased, stressed jeans, to polished dark shoes, starched white shirts and gray or tan khaki slacks, sometimes with ties. They became cool, respectful, rational and more distant with me. They repeated often the scriptural story about young Jesus, accidentally separated from his parents on a visit to Jerusalem. When by standers asked Him about where His parents were, He answered, "I have no mother and father." They told me that they, like God's son Jesus, were filled to completeness with the Father and the Holy Ghost.

On one hand, their experiences sounded like those of the *activated mind* state of Abraham Abulafia, a suddenly emergent *Nevesh* and my father's metaphysical talks about personal transformation. My personal secular-computational brain God spoke to me of the mechanisms of sudden personality change, a *phase transition* in *complex systems*, in the context of the *nonlinear dynamics of brain and behavior*. On the other hand, their global changes in mind felt both alien and threatening. When I came to learn their churches' full list of expectations, rules, requirements and sociopolitical policies, I found that I could not identify with this system of spiritual knowing at all. It felt rigid, righteous, unforgiving, even angry, and it frightened me. I never anticipated that my culturally enriched, intellectually sophisticated sons would be quoting Pat Robertson and Jerry Falwell.

The Freudian psychoanalyst of my younger days tried to write off these (to me) cataclysmic changes as manifestations of male sons' unconscious oedipal strivings to father kill and thus become. After some mulling, my theory did not wash.

They spent time accompanying themselves on guitars, singing hymns and shouted Corinthian Paulisms to small curious crowds gathered in beach parking lots, city parks and inner city street corners of Southern California. They passed out pamphlets containing New Testament tracts and formulaic aphorisms promising the post-repentance blessings of Jesus. The eldest, articulate, bright and prematurely worldly, had been an ardent memorizer and appreciator of Shakespeare, especially the mystical *Tempest*, the music of Aaron Copeland and Igor Stravinsky, the improvisations of Charlie Parker and Cannon Ball Adderley and the provocative literature of the time including Jack Kerouc's *On the Road* and Hunter Thompson's *Fear and Loathing in Las Vegas.* They loved riffing with the Voltairean pungency of Frank Zappa's lyrics. Now, nihilistic humor had become an anathema.

Several weeks after my eldest son's transformation, I found him in the garage using a hammer and an empty barrel for disposal as he destroyed his modern jazz and early rock record collection. He ridded himself of all of his fiction and most of the nonfiction books in his young but relatively large personal library. His new energy and high purpose emerged as a clearly defined set of rules of behavior, a strong stand against abortion, frequent talk about the need to escape from the contaminating influence of MTV culture, as well as our years of talk about the biological and physical sciences. Both boys were particularly critical of my Darwinian flavored attempts at scientific explanation of man's inner life using the selective and adaptive neurobiology of brain mechanisms and behavior. They spent increasing amounts of time with Church friends, seldom seeing their old ones. The eldest's college goals turned from plans for a U.C. Berkeley equipped career in literature and creative writing to a none spiritually challenging, objective and practical, Christian free market finance and accounting degree from U.C.'s Business School.

Gone were shared magical hours of intellectually stimulating, humorous, even scholarly discussions. In place of evidential talk in areas of philosophy, literature and science, their opinions and claims derived exclusively from biblical quotation. Their particularly favorites were Paul's letters and some of the later prophets, particularly Jesus-auguring Isaiah. "In the beginning was the word..." became the real reality. The meaning of life was Scripture as explicated by their *book church* pastors. They scribbled notes in the margins of their Bible pages during sermons They were displeased when I interpreted the wild imagery and *666* symbolism of *Revelations* from the point of view of the historicity of encoded political messages, meanings hidden for the safety of the early Jews in their world of Greco-Roman governance. Twenty-five years, before the glut of books by Tim LaHaye, my well-educated sons claimed that *Revelations* was literal and foretold the coming *tribulation* that augured the end of the world and ascension to heaven of the believers. My youngest, since childhood a well-read history buff, now viewed New Testament scripture as sui generisly, divinely and literally true. They said the conduct of their lives their meaning had been clarified by the biblical truths revealed to them by The Book. What I did not say was that much of the talk seemed to me to be an intellectually and spiritually impoverished miasma of cant and righteousness. At the same time, their remarkable transformation appeared to be the expression of a powerful and mystical force, the scientific understanding of which has been the ostensible focus my life's work. Why did their alterations appear so alien, strange and forbidding?

Born to a home of psychoanalytically and scientifically oriented political liberals, these precociously bright and worldly sophisticated young men were suddenly transformed into, unrecognizable to me, radical Christian Fundamentalists. They are now in their late thirties and remain just as ardent, Christian patriotic, Right Wing voters to this day. The eldest is now an executive in Morris Cerullo's San Diego based, worldwide missionary movement, raising money for revival and media ministries. He travels to and is involved with hundreds of Fundamentalist Christian churches in countries ranging from Argentina and Africa to the Middle East and Russia. He hasn't allow me to contact his children, my grandson and granddaughter, because, in vague talk and mostly silent implication, I and people like me are seen as sources of potentially satanic, worldly contamination. He feels wronged by the way I am. He once chided me about what he saw as my futile spiritual search in what he called the "health food" Eastern and brain religions. My youngest, only a little less ardent and critical, visits occasionally, and, hands in the air and *speaking in tongues*, prays to the Lord for my salvation.

Of course, this sudden and long lasting personal transformation in the direction of *Fundamentalism* is well known and almost commonplace in modern American and European Jewish, Christian and Moslem college educated middle class families. The Saudi Arabian World Trade Center bombers were, mostly, well supported children of the educated middle class We recall the famously tragic American radical Moslem, Richard Reid, the would be airplane shoe bomber. My stomach clenched as I heard Richard's sophisticated and obviously caring father share his confusion and struggle to rationalize what had happened to his son. The commonality of this kind of spiritual and life transformations in the educated young makes each event no less painful. On the other hand, we know that healing transformations in the name and spirit of the Christian God can lead to quite positive realities. They are effective in even quasi-secular disguise as in Alcoholics and Narcotics Anonymous, Synanon and in the rehabilitation of the Charismatic Christian, ex-alcoholic, Southern Methodist politician, George W. Bush.

Paul Holmer, Professor of Theology at Yale Divinity School gives thanks to the *evangelicals* who "...keep alive the radical breach that the gospel is from the *nous* of this world...they (*Fundamentalists*, *Evangelicals*) look marginal if you are churchy...intolerant if you are ecumenical...anti-intellectual if you are trying to systematize... in their roughness and ...abrasiveness." I bring personal and painful witness to these claims. To get to the personal meaning and mechanisms of these transformations, I had to start from somewhere. I am wedded to the belief of the Jewish ecstatic, Abraham Abulafia, and not those of Moses Maimonides, that the human mind in an altered state of *activated intellect,* man's *Nevesh*, can understand such mystical happenings. I would continue to work at it.

One of the early personal church experiences with my sons' religious path came after accepting an invitation to go with them to a Sunday service at their current charismatic church. By then, the eldest was married with children, the youngest, unmarried, was teaching bilingual mathematics in high school. I had waited several years for this occasion.. The meeting took place in a large, gray, unmarked warehouse building that was crowded in back with high stacks of storage cartons. The large, cement floored, open space in front of the storage boxes was occupied by rows of metal folding chairs. They faced an unadorned, elevated wooden platform upon which was a lectern and microphone. Behind the lectern stood a casual array of a dozen or so young people, singing hymns and playing a variety of instruments. These included piano, two or three guitars and upright bass, tenor saxophone, trombone, trumpet, mouth organ and two snare drums. Sounding a bit like a Salivation Army Band, they played and sang, “They cast their nets in Galilee just off the hills of brown; such happy simple fisher folk, before the Lord came down…the peace of God, it is no peace, but strife closed in the sod. Yet let us pray for but one thing, the marvelous peace of God.”

The building, used for commercial storage, packaging and mass mailings during the week and a *Charismatic Christian word church* on Sunday, was located at the rear of an unfinished strip mall. A new and well-polished yellow Cadillac Deville was the only vehicle parked in the no parking zone immediately in front of the entrance to the warehouse. My youngest explained that the car belonged to Carl Austin, the self-discovered and declared pastor, who spontaneously *rose up to lead* without academic religious training or a conventional ordination. The bright yellow car was explained as evidence of the power of God. Paraphrasing Mark, my son told me “…he who does not doubt in his heart and believes that those things he says will come to pass, he will have whatever he says…whatever things you ask for when you pray, believe that you receive them, and you will have them.” The car served as a glorious instantiation of the church’s major promise of the rewards of faith.

Pastor Carl Austin, a tall, blonde, portly man in his early thirties with a resonant tenor voice, was the youngest of several children of a poor Midwest farm family. He had been a state college drop out and without a career or a job. His sermons contained stories about how he had caught spiritual fire at a revival meeting conducted by Kenneth Hagin of Kenneth Hagin Ministries, aka Rhema

Bible Church, Tulsa, Oklahoma. The pastor's witness of the Holy Ghost acting through his life was his personal cure, by transformative Grace, of a triad of self-destructively sinful addictions: alcohol, gambling and promiscuity. Self-chosen and self-declared, he now served this two and a half year old growing congregation of over 200, mostly young, working families. The young men in attendance at the warehouse church were in shirts and ties, very unlike the more casual garments of even dressy occasions in Southern California at that time. Women were dressed simply and modestly. Most of the children were in Sunday school in a small neighboring store in the strip mall during the adult service. The few that accompanied their parents were remarkably well behaved I was told that most families tithed 10% of their income. They quoted Hebrews, "...king of the righteous...to whom also Abraham gave a tenth part of all...." They believed that their tithe would be returned manifold and the yellow Cadillac Deville served as Pastor Carl Austin's personal evidence. From these funds, the congregation supported the pastor, his car, the rental expenses of the Sunday warehouse church and an orphanage in a small Mexican border town. Some of these children, several neurologically disabled, were bussed to the Sunday service for healing. They sat together in a section in the front of the congregation and were the beneficiaries of the second Sunday collection plate, passed around after the first one that was designated for the church and its pastor.

The first Sunday sermon I heard in the warehouse followed several awkward minutes of Pastor-directed warm up hugs of neighboring strangers while the choir sang hymns. The songs were accompanied by instruments playing the melody in unison sans harmony, and accented by the beats of two loud drums. As the volume and pace of singing increased, I saw several episodes of ecstatic looks and fainting, *dying in the Lord* and *shouts of praise* with *upraised hands*. The intermittent elevation of the hands during prayer and song appeared to be spontaneous. I was told that the arms were up as antennae, feeling the energy of Lord all around us. The pastor's topic was *forgiveness.* From *Ephesians*, "...let all bitterness, wrath, anger, clamor, and evil speaking be put away from you, along with all malice... be kind to one another, tender hearted, forgiving one another, just as God in Christ also forgave you." In the middle of his sermon, which built slowly in tension and volume, the pastor introduced a forty-ish, sparkly eyed, somewhat overweight, dark haired, slightly made up woman who the Pastor said was a witness for the ultimate in Christian forgiveness. She was someone from whom all of us could learn. She was the mother of the 7-year-old boy that he, the Pastor, had, four years before, accidentally killed during a drunken driving episode in his "other life." That was the one he was living before he was saved. I was told that he presented her in a service at least once a year. The woman said that her successful struggle for forgiveness led to her being saved. She quoted Ephesians, ”And you who were dead in trespasses and sins hath he quickened." She looked radiant and hugged the pastor. When my sons introduced me to him as we filed out at the end of the service, the pastor told me that my visit was important to the congregation. He told me that Jews were special in Charismatic Christianity since we would play an important role in the *return*. He said he hoped he would see more of me. My boys seemed pleased to have invited me.

I accompanied them to their church most Sundays, and often for what they called the "rock and role healing services" on Wednesday night, for over two years. Within three or four months I found myself, the first time while awakening out of a deep sleep, mumbling sounds that I was told sounded like some unknown language, I was praying in tongues. At some services it happened spontaneously accompanied by an almost ecstatic feeling accompanying the surrender of willful control. This was usually accompanied by the release of new energy. I recall thinking that the spontaneous, nonsensical linguistics shorted out my verbal and obsessionally logical left brain allowing the unbridled expression of my hysterical right brain. Sometimes in agreement with an insight offered in a sermon or when particularly moved by a hymn, I found my hands lifting skyward, right hand and arm higher than left, with a high feeling of trust and delicious surrender of conscious cognitive control.

Reading the *New Testament's Acts*, I learned that we were re-enacting the scene of the *Apostles* in the *upper room*. Those gathered there were the ones chosen by the risen Jesus to be able to see Him, the list including Peter, James, John, Andrew, Philip, Thomas, Bartholomew, Matthew, James, Simon and Judas. "…they were all filled with the Holy Spirit and began to speak with other tongues, as the Spirit gave them utterance…" The secular psychoanalyst in me tried to make an analogy with the joyful jazz lyrics of Ella Fitzgerald's scat singing, I'd done a little of that during my small jazz group pianistics as an a adolescent. I thought about how verbally paralyzed stutterers could be articulate when singing what they mean when they could not talk it. I wondered about the relevance of the spontaneous *poetry of slams* and *Hip Hop rapping*. We attended what my sons called *charismatic black Baptist churches* in South Los Angeles and Long Beach. These often four hour services usually featured two wonderfully harmonic echoing choirs with organ and drum punctuation of the speech-singing, sermonizing Reverend. Large and beautifully dressed black women sang operatically and danced gracefully down the aisles. I joined my sons in this *joyful noise* for these long services and, exhausted, I was forced to go home for a Sunday afternoon nap.

In spite of what could be regarded as validating experiences with the real life Holy Spirit, I continued to be generally confused and even more deeply estranged. An inner voice kept recalling my spiritual failure as a parent and being traitorous to my Jewish ethnic identity by Christian church attendance. I tried to understand how my sons had traveled from where I thought we were living together to this entirely new world. How did it happen? Could the path going there and back be meaningfully reconstructed and then reversed? This idea is consistent with the medical dictum that knowing the cause, the treatment logical follows. My education had shown me such assumptions of reversibility need not be true.

Contrary to the beliefs of early physical mechanics, medical psychiatric history takers and psychoanalysts reconstructing childhood events, the modern physics and mathematics of complex systems says *phase transitions in complex systems* are probably not reversible, at least not simply so. One of the features of global changes in complex systems, often called *bifurcations* or *phase transitions* (think heated water going suddenly to a boil), is their dramatic discontinuities in behavior. Knowing only the initial and end state, *phase transitions in complex systems* do not allow for *point-to-point backtracking* or *specific linear-causal* understanding. These *discontinuous and global transformations* are the stuff of miracles, especially for physicists. Even with respect to initial and end-states, rather than using straight forward phenomenological observation, the *mathematical and physical theories of phase transitions* are usually dependent on not necessarily intuitive, derivative physical quantities. Their verbal representations are often not concrete but metaphoric. This retreat to derived and abstract, far from the primary data computables, may be more evidence of man's many insufficiencies in understanding of the mysteries that are often placed in the spiritual realm.

* * *

Driven by an effect that contributes to cause, like the faith-driven abandonment to God that generates more faith, a drop of water hanging from a faucet is pulled down by its own gravitational field as the thinning neck of the drop facilitates its own further thinning. A gobbet connected by a thick neck to the main drop begins to separate. The neck between them thins and breaks, and one becomes suddenly and irreversibly two. A *continuous* structure has suddenly become *discontinuous in finite time* at what is called a *singularity*. Since the single measurable feature that dominates the water's behavior around this singularity is the *diameter of the thinning neck*, a *derivative physical, one-dimensional observable,* neither the details about where it all began (called the *initial conditions*) nor the *path* it followed to get to the moment of fracture, are predictively relevant with respect to the *sudden transition*. Considering this kind of phenomenon going on in our brains, choosing between theories of behavior that involve changes in brain cell groups and/or brain chemicals versus those that involve behavioral quantities, may be neither possible nor necessary. The challenge is to place the problems of cataclysmic change in brain and behavior in sufficiently abstract and universal terms that can be represented in some low dimensional, computationally accessible space of variables.

The *simplification and stereotypy of behavior around singularities* reduce the number of features that are required to discuss the dynamics of change in what would otherwise be a complicated beyond reach situation. One of the properties found around singularities, is the *loss of absoluteness in contextual characteristics* such as the *scale* of the observation. We no longer can say that what we are studying happens in inches or miles, in seconds or days, now or in the past. In the place of a single unit of relevant measurement, we have a distribution of spatial and temporal feature sizes that stretch toward both the infinitely small and the infinitely large.

We can illustrate a dynamical transition involving the *passage of the system through a singularity* by using the metaphor of another kind of water experiment. If we pour a small amount of water through a filter full of coffee grounds, or watch our coffee maker do it, the first spurt of water makes an incomplete path of wet grounds in the bed of dry ones. The next bit of water soaks this path more thoroughly and may form additional and multiple, new and branching, incompletely penetrating paths. Eventually, on just one more of these pourings, a connection in the paths occur, such that the water snakes all the way through the coffee grounds and the first brown drop of coffee falls into the pot. At this flow singularity and opposite to the dynamic of a faucet water drop, *a discontinuous system of pathways becomes continuous in finite time* in a process called *percolation*,

Trying to set up a predictive model, we can count the number of water deliveries that occur before the first drop finds its way through. Repeating the experiment many times yields a span of the number of pours required to reach the singular point of percolation. If we do the experiment enough times, the distribution of the number of pours required to reach percolation will range from one toward infinite. In the *neighborhood of the transition*, time as recorded as the number of small pouring events may stretch.

In aa comparable system, as elegantly described by Detrich Stauffer in his Springer-Verlag book on *percolation,* multiple hot spots in the woods can suddenly fuse into a forest fire. Isaiah said, “…glorify the Lord in the growing fires of dawn…” Faith fires spreading through a faithless dense forest, its hot irregular front damped by the disbelief of water-filled leaves, or disillusionment gaps of already burned out trees, can, under the right motivating conditions of dryness, wind velocity, tree density, kindling temperature and desperation-induced willing of faith, sweep through the entire woods in a sudden blaze. This is the *spirit of percolation*. Computer simulations of percolating blazes generate a *multiplicity of life times* of forest fires *near the singularity* that represents the *transition to a global conflagration*.

Mentioned previously is Rudolf Otto's 1917 book about the characteristics of religious experience, *Das Heilige*, *The Sacred*, which described phases in the discontinuous transition from everyday life to the *wholly other* (*ganz andere)* reality of the world of the sacred. They include intense, numinous experiences of fearsome ambiguity, dawning awareness of awesome mystery, revelation and appreciation of the majestic power and finally, entrance into a reality of an entirely other place and time than the natural and secular which Mircea Eliade called *profane.* In his 1958 book, *Patterns in Comparative Religions,* this well-known historian of religion called the revelatory occurrence of sacred reality an *hierophany.* Eliade's classic work, *The Sacred and the Profane,* contrasts the homogenous, spiritually formless and relative world of the profane with the results of passage through spatial and temporal singularities to a place and time that are not of this world.

Poincaré said that the brain did not know of *absolute space*, but rather established a model of it through internal reconstructions of sequential sensory experiences that accompanied our exploratory movements. Activity generates the internalized, *partial differential*, *equations* (describing changes in the observable with motions in space) required for representing the dynamical cartography of the world. It was Poincaré's habit to *topologize the dynamics of motion* in mathematical problems that lacked *analytic solutions*. In this way, simple algebraic operations replace some of the insoluble problems of the calculus. Eliade's *sacred space* defining *singularity in the plane* that breaks profane homogeneousness, a center point that is no longer a circle, can be viewed also as Poincaré's *topological center*. His topological brain theory found expression in the formal representation of internal space as the invariant product of an organism's *displacement groups* of imagined or real physical movements around such *singular fixed points*. The operational object called *groups* defines this kind of algebraic, mathematical structure and motion.

associated with the loss of habitual temporal-spatial contextual moorings. A mind at time one and the same mind at time two are unconnected. They are *wholly other*.

In much the same sense, for Eliade, *sacred time*, like space, is neither homogenous nor linearly continuous. *Sacred time is circular, recoverable and reversible*. Past, primordial, mythical time can exist in the present. Religious festivals are recurrently ontological, allowing the recovery of the sacred time such that their past and present expressions are the same. *Rebirth is new birth*. In the language of the North American Indian Tribe, the *Yokuts*, the term for world (cosmos) and year are the same. A year and the world has gone by, only to start again. The *Dakota Tribe* says that the Year goes around the World. As Elaide has said, "…at each New Year…the world (is) recreated and to do this is also to create time…the sick man becomes well because he begins life again with its sum of the energy intact." *Healing by becoming another or renewed self* may become a frontier science in the yet unexplored field of *phase transition medicine*.

The quality of separateness, *discontinuity in states*, as occurs in the *same-different inside world*, is much like that found in the *stages of anesthesia*. Each stage of anesthesia is *ganz andere* from the others. In *Stage I anesthesia*, fast frequency, low voltage brain waves are observed and accompanied by a two Martini-like, mildly activated, sedated but exhilarated high. *Stage II*, the next deeper stage of anesthesia, is marked by the sudden emergence of intermittent bursts of high amplitude brain waves, and animals and man demonstrate bizarre postures, hallucinatory phenomena, fixed staring, and sometimes movements that look like acting out some symbolic drama. This stage marks the beginnings of the loss of responsiveness to painful stimuli. In the sudden drop into *Stage III*, a low voltage mix of mostly slow and some fast brain waves can be seen associated with depressed consciousness, complete insensitivity to pain, slow regular respiration and an unexcitable cardiovascular system. *Stage IV* is the deepest stage of anesthesia. This state is characterized by very low voltage, almost flat brain waves, a loss of spontaneous breathing, the collapse of blood pressure and, finally, cardiac irregularities and death in cardiac arrest. These are both *discontinuous and global brain state phase transitions*.

[redacted]

primary process by Freud and his followers. This forgotten language of the unconscious, an archaic needs and fear-driven tongue lurking beneath our supposedly objective discourse, comes to dominate themes of communication in the middle of these unfinished spiritual transitions. The *Rorschach Test* of master meditaters and LSD users overflow with conflictual primary process images, as does the talk of patients on the verge of schizophrenic decompensation. The primitive symbolism of *primary process* provides the major current in the overwritten prose of the hyper-religious temporal lobe limbic epileptics described previously and called the *Geschwind Syndrome* and in the regressed and iconic transference concerns of patients with tendencies for global and sudden phase transitions, prostitute to saint, righteous obsessional to conscienceless psychopath, called *borderline personality disorder.*

Primary process represents a dynamical brain state, one unburdened by linearly predictive connections with reality. It is a state without even a transient single defining physical time or other fixed measure of order. It is without the causal logic or knowledge of an outside reality that a brain implies in supposing to know. Its primitively instinctual style and goals contrast with more physically time-locked, reality oriented thinking which Freud called *secondary process* and Penn-Lewis referred to as ordinary and religiously lawful “reasoning faculties.”

An *absence of absolute time and space scales* with which the *executive ego* orders internal and external time and events, and therefore their relations, results in *primary process thinking* characterized by *condensations* of several, often incompatible, representations into one. Dueling, conflictual and simultaneous feelings and thoughts float from their relevant objects to others. In the *transitional transcendent state*, there may be confusion of self with others, of objects with their labels, of parts with the whole and of symbols with the things that they symbolize. This facilitates living in the spirits of the Father, the Son and the Holy Ghost at the same time. Mixed inextricably with saintly awareness and charisma, there are signatures of instinctually driven and configured primary process. Freud’s classical work on *slips of the tongue* concerned the intrusion of these instinctual thought stream condensations from the world of the *ganz andere* and displacements into everyday life. In this intense and quasi-fluid state, saintly priests slip seamlessly into sexual predation; an ecstatic Jewish Orthodox fundamentalist shoots 29 praying Moslems in a cave near Abraham's burial plot for Sarah in Hebron; what were lovingly mystical, Jelaluddin Rumi's Afghanistan (Balkh) descendents become people bashing and women stoning morality police; committed and mesmerizing Christian televangelists attend peep shows and seek child pornography; devoted Islamists crash airplanes into tall New York buildings.

In the physics of *condensed matter*, two common forms of multi-molecular or polyatomic *cooperative arrangements* are the *crystalline condition* and in some ways its opposite, the *amorphous glassy state* that results from rapid cooling through a melting temperature. The *microscopic atomic arrangement in glasses*, in contrast with the *crystalline state*, exhibits no spatial periodicity or long-range order. In contrast with fluids, the friction of passage of molecular elements of glasses past each other, their *shear viscosity*, is large enough such that their macroscopic shapes are maintained in the very slow flow for very long times. In-between the crystalline and glassy states their exists a multiplicity of possible *unstable arrangements* which result from what physicists call *frustration*, the *inability of a system to find a unique, lowest energy, ground state*. The generic example of a *ferromagnetic crystal* has two types of ordering principles: (1) The mutual alignment of the atomic *magnetic moments*, visualizable as the lining up of dipole, positive to negative, magnetic arrows; (2) The geometric crystalline low energy ground state described above.

When the *symmetry of these two ordering principles are incompatible*, imagine an arrangement of neighboring atoms that prefer anti-alignment of the magnetic moments which are placed on a geometrically triangular rather than a square lattice, there is *no single arrangement that can satisfy both magnetic and geometric principles.* What emerges in this *state of frustration* is the potential for a *multiplicity of nearly equal energy states*. Water has the potential for both geometric ice crystal symmetry as well as arrangements of hydrogen proton (+) to oxygen electron (-) magnetic moments (with well-ordered oxygen lattices but disorder among the hydrogen positions). It is therefore not surprising that a *multiplicity of*

indirectly by my sons and church elders about joining a study group for personal conversion.

I was surprised to learn that discussions of current political topics were a regular part of these discussions as well as the Sunday and Wednesday night services. We received a weekly political action committee report. Their issues involved abortion, school vouchers, sex education in schools, family planning, school prayer and carefully chosen Christian elected officials for school boards and the Congress. As a congregation, we frequently held hands in small circles and prayed for the electoral success of our issues and candidates. Twenty years later, this movement has evolved into the public political morality play of the Republican base of George W. Bush.

Laying on of hands, dying in the Lord, speaking in tongues, dancing in the aisles and praying with up stretched arms were routine in the hymn dense services. The goal for all was the *spiritual transformation of mind* as in Romans, "…be not fashioned according to this world, but be ye transformed by the renewing of your mind that ye may prove what is the good and well-pleasing and perfect will of God…" The pastor told us that the world ruled mind could not grasp spiritual things as in Corinthians "…they are foolishness unto him and he cannot know them, because they are spiritually understood."

My research took me to a collaborative project at a European mathematics institute for three months. I returned to our town very late on a Saturday night. I planned to surprise my sons by appearing at their usual choice of the middle service the next day. I drove up to the warehouse church fifteen minutes before the service was scheduled and found that the parking lot of the strip mall was nearly empty. There was no Cadillac parked at the front door. I banged on the double door when I found it locked. More then a little surprised, I called my eldest. He told me that four weeks before, the pastor disappeared, I later found that his disappearance accompanied that of the congregation's bank account, and no one knew where he had gone. He had not warned or informed anyone in the congregation about his plans. Calmly and without apparent awareness of my surprise and distress, my eldest asked me if I would like to attend the late Sunday morning service at their newly chosen Charismatic Christian church. He gave me its address and told me that the service started at 11:00 AM. There still was enough time for us to meet there. I wondered how the Pastor Carl Austin would use this incident in sermons about sin and redemption to his next congregation.

Further Readings for Pentecostal Phase Transitions

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CHAPTER 7:

AMPHETAMINE ROLL-UP AND SPLITTING

We try to understand the metaphysics and inner dynamical life of the committed, judgmental, fundamentalist believer. In these sacerdotaly rigid and faithful, disenfranchisement and righteous intolerance toward other denominations are simultaneous with spiritual compassion, mercy and forgiveness for the members of their own. This *splitting* between the good people and latent evil doers is seen by psychoanalysts and dynamically oriented brain scientists as an all too common, sometimes psychopathological, solution to the inevitable ambiguities of living. I am certainly not alone in being fearful of Fundamentalists: Jewish, Christian, Moslem and Hindu. From the overpass above the freeway, bearded Jewish Orthodox men rained rocks onto the roof of my rented car because I was driving on Sabbath. A research project had taken me to Jerusalem Mental Health Center's neurochemical laboratories for collaborative work with mostly secular Jewish scientists. *Halachic considerations,* those of Jewish lawfulness, comparable to the constraints of *Muslim shirah*, forbids working, even driving, on the Sabbath. Orthodox Jews live walking distance from synagogues or benefit from a *rabbinicaly blessed, network of symbolically covered walkways* for going longer distances on the Sabbath. This

Sabbarian grid of permission obviously did not cover driving on the free way to the mental health center.

It is the *splitting* of *us* from *them* that leads to the breakdown in empathy and compassionate identification with others. Studies of the dominance of direction of rotation within a closed space in small mammals have shown that *amphetamine-induced intensification* makes the choice of right versus left (or left versus right) rotation, *broken symmetry*, more statistically significant. In contrast, the Hefner Foundation of Switzerland has shown that *entheogenic drugs* such as *psilocybin* in man facilitate seeing both of the conflicting, simultaneously presented, right eye and left eye images in place of the usual dominance of just one of the two representations. A precondition of *compassion* might be that a person's brain be able to see and comprehend both or several sides of apparently conflicting points of view at the same time. The Fundamentalists do not see things that way. In the Koran, Mohammed says, "…give sustenance to the poor man, the orphan, the captive…and for the unbelievers We have prepared fetters and chains and a blazing fire…." In the New Testament's *Mark* we find the final words of the risen Jesus, "…whoever believes and is baptized will be saved but whoever does not believe will be damned." The Crusaders' claimed scriptural support for their murderous marches to reclaim Jerusalem.

Carl Jung wrote about the New Testament's *Revelations* in his *Answer to Job*: "…a terrifying picture that blatantly contradicts all ideas of Christian humility, tolerance, love of your neighbor and your enemies and makes nonsense of a loving father in heaven and rescuer of mankind. A veritable orgy of hatred, wrath, vindictiveness and blind destructive fury that revels in fantastic images of terror breaks out…overwhelming a world which Christ endeavored to restore to the original state of innocence and loving communion with God…" As Princeton University philosopher, Walter Kaufman, has noted in his *Religion in Four Dimensions* "…compassion for unbelievers is implicitly condemned and proscribed…Augustine argued expressly against compassion for the damned and Luther used invectives against his (religious) enemies…" How can this be God's setting for the spiritual work toward that promised in *John* "…that you love one another; even as I have loved you, that you also love one another."

In contrast with what has been described in previous chapters as the *entheogenic drug-induced transitions to a spiritual mind,* one is tempted to describe these Fundamentalists' states as the *amphetamine religions*. The Los Angeles Ram's Hall of Fame defensive end, on very high doses of amphetamine (125 milligrams compared with the diet dose of 5 milligrams) taken four hours before the Sunday games, the Baptist minister, Deacon Jones, used his famous and consciousness annihilating head slap to daze the opposing offensive tackle in order to gain access to and injure the other team's quarterback. Before taking the handful of *Dexedrine spansuls*, he would tell me, "See you on Tuesday." Along with the Deacon's destructive aggression was the other invariant feature of the actions of high doses of amphetamine, *compulsive stereotypy*, the fixity and driven repetition of over simplified actions and thoughts along with the loss of breadth of vision and adaptive flexibility. Deacon consistently *rushed inside*, *took the inside lane*, in spite of offensive linemen, who having studied previous game films, being set up to expect his route. They used this knowledge to take him out of the play. In modern theological parlance, judgmental rigidity and thinly veiled disapproval take the place of the more flexibly curious and lovingly humane feelings of the participants in the evolution in spiritual understanding of today's *liberal Protestant process religions.* These are the ones that believe that the properties of God evolve along with our biology, our brains and our growing scientific understanding of ourselves and the world.

Angry splitting is not just a stimulant drug effect. Recall my experience of the sudden emergence of a *first second wind* after a mile or so of my daily ten miles of running. It was frequently accompanied by inner bursts of obsessive, paranoid thoughts. Taking five milligrams of amphetamine felt much like the *first second wind*. I am full of energy with arrogant feelings of power, mind fixated in grand and simple ideas that I believe to be absolute and correct. I feel irritably intolerant about anyone or anything different. It is my virtuous duty to set everyone straight.

In the 1980's, Moishe Zar, a desert castle dwelling, settlement organizing, ardent Orthodox Jewish Zionist, now 65 years old, was the leading vigilante of the West Bank He planted bombs in the cars of Arab mayors and plotted to blow up the Dome of the Rock. Buying up farmland from the Palestinians beginning in 1979, many of whom were then killed by their own because they were seen as collaborators, Zar and his group of young volunteer settlers took over harvesting the Palestinian's olive trees and shooting rifles over the heads of those that would take them back. Fundamentalist Christians share his vision that the coming of the Messiah, the second for Christians, the first for the Jews, is dependent upon the complete return of all of the land of Israel to the Jews.

I recall that in the middle 1940's, my father took me to a fund raising dinner for the local chapter of the *Jewish Antidefamation League*. The whispered talk was about blowing up a warehouse in which anti-Semitic pamphlets were stored, planned for the middle of the night when it was unoccupied. Even at the age of 10, I could tell that their quiet anger and firm commitment made these threatened men feel less vulnerable. I understood a little more about the motivation for this proposed nighttime property destruction when, the following year, my father explained the reason for our being refused overnight rooms at several motels as we drove along I-95 in Southeast Florida. It took us until late night to find a place to sleep. This was America's muted version of what Hitler and his legions were doing to Jews that, at that time, was not generally known, except for Walter Winchell, in America. Resonant with our chemical-cultural theme are the many reports that Hitler was taking an amphetamine drug, *Benzedrine*, daily and in high doses for the last 20 or more years of his life. One can hear the characteristic, amphetamine-induced, higher pitched, rants in his recorded radio tirades. Compare the pitch and strained voice quality of the singing of Bob Dylan in his early records made while he was on *speed* with the gravely, much lower pitched voice, now that he is not. In our behavioral neuropharmacology laboratory at the Brain Research Institute at UCLA, Professor Charles Spooner and I used an *audiographic oscilloscope* to monitor the sounds of baby chicks whose peeps became higher in pitch and rate following injections of amphetamine. The earliest members of the methadrine-amphetamine chemical family were synthesized by the great organic chemists of the German pharmaceutical industry in the early 1930's.

The sequence of parallel streets in the neighborhood of my home and first grammar school in Kansas City, Missouri were my street, Virginia, then Tracy, Forrest and Troost. My school, Bancroft Elementary, was on Tracy and one block down that street was the Lutheran Day School established by German immigrants under the aegis of the Missouri Synod. Starting in the third grade in 1943, I was intermittently and unpredictably chased by rock throwing, "damn Jew" and "Christ killer" shouting boys from the Lutheran Day School. I had my choice of running for safety directly from Tracy to my family's half duplex at 4232 Virginia Street, or moving away from school via Troost and then down several blocks and around to sneak back to my home on Virginia without being spotted. One run-for-it afternoon, my parents took me to the emergency room of the Menorah Hospital to have my scalp sewed up where a sharp rock had landed.

When I asked my synagogue's young people's spiritual counselor, Rabbi Kleigfeld, to explain the feelings and actions of these children of Martin Luther's Post-Reformation Christian Church, he answered that I already knew about similarly difficult places and times of our Twelve Tribes' like Rome, Medieval Europe, the Spanish Inquisition, Persia (Iran) and, it was rumored, in Germany as we spoke. "Conversion or death" was its most benign form, in places like Spain and Iran, many Jews faked it, staying alive and practicing Judaism secretly. Kleigfeld told me that the causes of this historical theme of persecution of Jews were complex.

Among the frequently unmentioned events recorded in the later part of the worldly life of Mohammed, who lived from 570 to 632 AD was, "...in the name of Allah, the Compassionate, the Merciful..." his participation in the crushing of the Jewish tribe of al-Nadhir in 626 A.D., the beheading of 800 Jewish men of the tribe of Qurayza who refused to accept Allah as their God in 627 A.D. and putting to the sword the Jews of Khaybar in 629 A.D. As in the section of the Koran called *The Cow*, Mohammed proposed to "...fight against them (the infidels) until idolatry is no more and Allah's religions reigns supreme..." In contrast, the more entheogenic spiritual orientation of the ecstatic followers of Mohammed in his earlier years speaks of the multiplicity of valid *Ways to Deep Truth*. The acceptability of many ways is supported in the tales from the millennial oral tradition of the Sufi Masters in their *Teaching Stories*. One of them, *What Befell the Three*, is attributed to the early 18th Century Sufi teacher, the Dervish Murad Shami. In it, an apparition is mobilized by the concentrated Truth seeking efforts of three *Sufi Dervishes* named *Yak, one, Do, two* and *Se, three.* When this "…white smoke head of the very old man…" was asked what he was, he answered "…I am what you think me to be…have you never heard the saying 'There are as many ways to the Deep Truth as there hearts of man.'" In the narratives about the lives of the *Mevlevi Islam dervishes* called *Munaquib el-Arafin* (1353), *Jalaludin Rumi*, the Sufi saint, instructs his ill and troubled petitioner to ask forgiveness from the Christian he recently spat on saying "…whether a ruby or a pebble, there is a place on His hill, there is a place for all…" Cole Barks and Michael Green's *The Illuminated Prayer* (2000) notes that the Rumi follower, *Bawa Muhaiyaddeen*, a modern Sufi guru, was said to be keenly aware how quickly spiritual *entheogenic systems can become amphetamine-like* and "…develop rigid marching orders …which turn into a dumb obsession with other people's behavior…"

It appears that entheogenic and amphetamine spiritualities can coexist contemporaneously, in Islam as well as in all the other of the world's great religions.

One day, sneaking home from school, taking the long way around via Troost, I was spotted and chased up some stairs into an apartment building's dark hall. Terrified, I swung hard and hit the leading angry and noisy head with a propitiously found snow shovel that had been left near the apartment's entrance. An ambulance was called to tend to the twelve-year-old, transiently unconscious, Lutheran boy. He recovered completely within a day and the chases after school and my desperate escapes stopped suddenly, never to reappear. After several months, our family crossed the socioeconomic divide in Kansas City to a more tolerant, upper middle class, Southside neighborhood near Rockhill Road, to a suburban home, one block from Missouri's border with Kansas. There, persecution for my Jewishness took more subtle forms such as not being permitted to play teen-age golf with my friends, though invited, on their Blue Hills and Kansas City Country Club's golf courses. It was decades later that the first Jewish member of the KCCC was the founder of H and R Block. Unable to afford membership in the single all Jewish country club of the region, I practiced for my high school golf team on Armour Hills Public Golf Course, where, at the time, mostly white working class golfers played.

How can it be that spiritual states include both personal humbleness and loving mercy toward some of mankind and judgmentalness, nonacceptance and commitment to seduction, threat and even violence in the service of invoking changes in the beliefs of others. How can the *high energy calm* of being home at last in the *born again condition* with its new freedom from self assaults about sin, most importantly that of disbelief, but also peccadilloes such as drunkenness, promiscuity and familial abuse, be associated with readiness to judge, harass even persecute others. Psychoanalysts would say that it is a riddance mechanism, the projection of unwanted personal traits onto others. From the standpoint of rational thought, this seems more like non-Aristotelian cognition, two, not either-or, countervailing orientations toward mankind held simultaneously. The newborn parishioners of these *charismatic amphetamine churches* express their fealty to God with strongly held beliefs that diagram logically as contradictions. The perception of the world's peoples into believers and infidels, good and evil, our people and your people, ourselves and the others. It is generally believed among social psychologists that it is the perceived *nonpersonness of others*, which allows the cruelty that empathic identification with them would never permit. *Splitting* feels like resolution, its *stereotypy* reducing the complexity of spiritual thought as well as true to life perception.

A concrete laboratory example of *amphetamine conversion*, the sudden transition to a high energy, fixated, and delusional state called *amphetamine psychosis*, is supplied by experiments in humans conducted by Professor John Griffith at Vanderbilt University in the 1960's. These experiments would not be allowed by today's human research committees or medical ethicists. Each one of a group of psychologically screened-as-normal graduate student volunteers, at an individually unique amphetamine dose, developed suddenly a personally unique and peculiar system of new beliefs, obsessionally held as rational thoughts. Ten milligrams of amphetamine were administered to volunteer subjects every hour until every subject crossed their particular threshold for *personality change*. The graduate students underwent a global mind-brain-person transition at differing total doses of amphetamine. The subject's world was suddenly transformed into one of enemies and friends. The syndrome dissipated over several hours when the drug was stopped and the plasma levels of amphetamine and its metabolites declined. As amphetamine makes memory formation and recall stronger, the subjects were embarrassed when remembering what strange and forbidding yet uneatable things they so strongly believed. These included such things as: they as good people were caught in a network of bad person Russian spies; some threatening others arranged for poison gas to be seeping out of the water faucet; the white coated scientists were CIA undercover intelligence officers hoping to get information about their small pornography collection. The subject's world had become divided in, for each person, a stereotyped way.

After a couple of weeks of return to normal living, the experiment was repeated. Each subject again developed his or her individually unique set of good-guy, bad-guy delusional beliefs and at the same dose of amphetamine as before. Like those of strong faith, their ideas once again resisted the logical arguments made by the professional staff: that the new realities were neuropsychological and had an obvious pharmacological origin. While on the drug, all stuck to their story, even while being shown the movie record of their first drug-induced episode. There is reliable scientific literature describing kamikaze pilots on high doses of amphetamine in an ecstatic state of Shinto nationalism. With their planes loaded with explosives, they deliberately crashed their planes onto American aircraft carriers in the Pacific Theater of World War II. One wonders if these drug-induced states occur in the drug-free condition in today's abstemious Muslim suicide bombers.

A more abstract and general way of thinking about the sudden emergence of fixation, repetitiousness and splitting in feelings and thoughts involves the emergence of regular *limit cycle oscillations* in a complex system that was behaving previously in a stable but flexible way. *Locking up* into a fixed, *closed loop*, is a common way for electrical circuits, computer programs, brain mechanisms and other complicated systems, even cultural or spiritual movements, to behave when one or more important control parameters crosses a threshold. Doyne Farmer of the Los Alamos's Prediction Company once said about this vulnerability in complex system, "Those things can hardly wait to roll up." The *limit cycle lock-up* occurs most often as a sudden, discontinuous change, called a *bifurcation,* into *autonomous self-oscillations* from an equilibrium state around which there was some random variation. A *bifurcation, a discontinuous change in outcome from a smooth changes cause*, characteristically occurs when the amount of an important influence, a metabolic state, a drug, a psychodynamic conflict or level of emotional stimulation crosses some critical value. The switch from one type of dynamical behavior to another looks like the system has suddenly changed into something else with an *entirely new kind of life* of its own. In the new life *of rolled up, locked-up repetitious motion,* almost all new starting conditions follow pathways that lead into the same limit cycle pattern. Evangelical Christians talk about *all born again life being in Jesus, fixed in a complete set of moral, social and political beliefs, ideas and judgments.* The *limit cycle* gets its name because the end state of the orbits of almost all starting points of the dynamics winds up being drawn into the same fixed, repetitious pattern of a stable cycle. Visualizing the simulation of one kind of *bifurcation to a limit cycle* on a computer screen, we see a slightly jiggling point explode suddenly into an orbit of ceaseless rotations around a circle.

Ralph Abraham, the University of California at Santa Cruz pioneer in graphical approaches to nonlinear systems, describes, cinemagraphically, the emergence of limit cycles from a single point. He starts with a picture of an *attractor* of water flow in the shape of a basin. All water that enters the basin, rolls down its sides to the bottom, to what physicists say represents a *potential energy minimum*. A little more technically, this *attractor basin* is composed of the set of all points such that the orbits that flow from them tend to end up inside the basin as time goes toward infinity, no matter where they start. Changing the value of a control parameter of the system changes the shape of this basin-like landscape, of the surface of the systems dynamical actions called a *manifold,* which can intuitively predict how the fluid will flow upon it. If we start with a simple bowl, a *parabolic basin*, then the *attractor* itself is a point at the bowl's very bottom. Changing the value of some influential parameter may induce the sudden formation of a small hill, growing at the center of the basin's bottom. Now fluid flow in the attractor bowl runs down to a path around the hill at its bottom. The autonomous motion of the fluid flows takes place now in a *circular orbit.* The *basin of the new attractor* is the original bowl minus the point at the top of the central hill. The fluid flow around the hill at the bottom of the basin is circular and is called a *limit cycle*. *Note that the direction of the rotation of the limit cycle can circle in one direction or the other*. In some computational simulations, *motion alternates between directions*. This suggests the aspect of the born again amphetamine religions, *splitting.* There is an unstable and intermixed probability of right versus left turning directions and their alternation. This vulnerability to directional *splitting* and often *unpredictable alterations* in action themes can represent what seem to be paradoxical combinations of both good and evil in the same strongly faithful, for example, the apparent bidirectional morality of generous and loving, pederast priests.

These mathematically flavored images of the sudden emergence of a limit cycle in complex systems was made biologically concrete to me by research conducted by one of my first graduate students, David Segal. He is now a professor of psychiatry at the University of California in San Diego. His program of work involved the administration of very gradually increasing doses of amphetamine to rats while their behavior was being monitored and recorded by a continuously running video camera. He documented the behavior of rats in a walled rectangular space within which, without drugs, they first wandered about randomly and then settled down to rest in an individually selected, favorite *home corner*. Segal called all of these phenomena, *patterns of exploratory behavior*. At doses of amphetamine below 2.5 milligrams (mg) per kilogram weight (kg), the exploration of the entire bounded space proceeded faster than was the case with their salt-water treated controls, their paths being more uniformly distributed throughout the box. They spent less time resting in their home corner. At almost precisely 2.5 mg/kg, the rat's behavior changed dramatically into an entirely new pattern of *continuous circling*. As was the case in the *abstract manifold* picture of *bifurcations to limit cycles*, some rats tended to circle their chamber to the left and some to the right and switching between them was often seen.

The influence of amphetamine and other brain dopamine neurotransmitter-mediated drug manipulations on *directional turning tendencies* in rats, mice and cats were the focus of brain and behavioral research of Professor Stanley Glick of the University of Massachusetts. The asymmetry of dopamine concentrations in the two sides of the brain, particularly in the *medial prefrontal cortex* and the brain stem's *nucleus accumbens*, predicted both the paw preference for pellet reaching and direction of turning in several studies in rats. These findings were statistically true over a population of rats, but not necessarily predictive for any single one. Reminiscent of the conflict between good and evil in our human spiritual analogy, naturally right turning male rats and left turning female rats, when compared with the opposite paired group, were greater voluntary ingesters of alcohol placed in their water bottles.

Splitting as a part of the phenomenology of *limit cycle bifurcations*, with directional implications for good and evil, has neurological support in humans as well. In the context of contrasting *right versus left hemispheric temporal lobe syndromes*, recall that temporal lobe seizures with a right side excitatory focus leads to the development of the *Geshwind Syndrome*, a high, softly energetic and saintly state of spiritual preoccupation and voluminous writings, loving and generous kindness toward all and the complete disappearance of sexual interest but not sexual potency. A left temporal lobe excitatory focus leads to the development of the *Kluver-Bucy Syndrome* of indiscriminate aggressiveness and hypersexuality. Experimental simulations of this syndrome in cats lead to them mounting and attacking living and nonliving things, even chairs. A variety of manipulations of the symmetry of brain dopamine concentration and dynamics by its characteristic drug, amphetamine, interact with lateral brain lesions such that we conclude that the stimulant-induced limit cycle lockup remains a phenomena influenced by drugs, sex, genetic predisposition and several other experimental conditions. This situation is perhaps not so different in variety and complexity from the range of representations in art and literature of the *left hand of evil and the right hand of grace*.

Oscillations that appear spontaneously in nonlinear systems without external periodic input were known to Henri Poincaré in 1882, and were systematically studied and made accessible to non-mathematicians by early 20th Century Russian mathematicians and physicists, well represented by a 1949 book, *Theory of Oscillations* by the Russian engineer-mathematicians, A. A. Andropov and C.E. Chaikin. Another relatively early classic is *Nonlinear Oscillations* by Nicholas Minorsky. The most common form of *transition from a fixed point to a limit cycle* was pictured as changes in the surface of the action, the *bowl-hillock manifold* in the paragraphs above, and is called a *Hopf bifurcation*. Recall that bifurcation means a discontinuous change in an observable over a continuous change in what is known as a *control parameter*, such as dose of amphetamine or intensity of an experience. The mathematical mechanism resulting in circular directional motion represented by the *(eigen)vectorial states*, was named for the German mathematician, Eduard Hopf. His 1942 paper was a mathematical proof of its existence and was discussed in the context of *fluid flows* that role up such that *circling vortices* arise from smooth, called *laminar*, water flow, at a critical value of the flow rate. Hurricanes are another example of these kinds of dynamics.

The *Hopf bifurcation* to *limit cycles* has been found in several, many dimensional, physical, chemical and biological systems. The latter include calcium conductance oscillations in the excitable membranes of muscle, heart and the brain, cardiac arrhythmias such as *ventricular flutter* as well as oscillations in population numbers in foxes and rabbits, predator-prey systems. California Institute of Technology's Professor, James Old and Johns Hopkins Professor, Joseph Brady made experimentally obvious the potential for the rigid irrationality implied by the brain's inclination to be locked up into limit cycle behavior. They demonstrated that animals, from rats to monkeys, could get locked up in apparent self torture, repeatedly and endlessly pushing a bar to deliver current to pain systems in the their brains. These pushes induced almost unremitting screams in monkeys and what appeared to be rageful biting and then immobilized resignation in behaviorally depressed rats.

Freud's last paper, *Analysis, Terminable and Interminable* (1939), featured examples of what he perceived to be the unsolvable mystery of helpless psychological entrapment in repetitious patterns of self-destructive behavior. He blamed the Iliad's and Odyssey's villainous immortal, *Thanatos,* the ever-threatening spirit of death and destruction to contrast with the good, life giving *Eros.* The Yiddish word for a personified *Thanatos* is *Moloch ha-Moves*. A range of fixations in self-excitatory, repetitious, self-mutilating behaviors is documented in domesticated animals. Dogs, particularly German Shepherds and Labrador Retrievers, can lock up in compulsive grooming cycles of what is called *acral lick* in which endless licking of paws or flanks lead to the break down of skin into seeping-sore dermatitis, which, in turn, stimulates more licking.

Mark Twain wrote a story about his getting stuck in ceaseless mental repetitions of a catchy, clangy poem. He could not stop reciting it to himself even after days of sleep loss and anorexia. He was finally cured by relating his problem and the poem to his pastor who he then unwittingly heard creating a community epidemic by including the rhyme in his following Sunday's sermon. Psychologists, who study this form of human *mental limit cycle attacks*, call this state of internal, repetitiously recited, poetic stuckness, *earworms*.

There are additional invariants of sudden transformations into spiritual-mind-brain bifurcations into a limit cycle lockups and, as discussed, one of them is psychological *splitting.* In psychoanalytic theory, as first suggested by Freud in his 1937 written and posthumously published paper, *Splitting of the Ego in the Process of Defense* (1940), *splitting implies two simultaneous and contrary psychological reactions*, one can be conscious and the other unconscious. They can both emerge in conflictual situations involving adaptive efforts of the personality to deal with the opposition between some form of powerful instinctual pressure and attendant perceived or imagined danger. Otto Fenichel's *Psychoanalytic Theory of Neurosis* (1950) elucidates multiple manifestations of *splitting of the I* (more technically, the *ego*) into a *conscious* part that knows reality versus an *unconscious* part that denies it. In some situations, a logical view contends with a more irrational, magical one. Today, the morning group praying, evening hymn singing, Christian Republican Right Wing feed their feelings of being on the side of God by dividing people into those that are like them and good and those that President Bush and Attorney General John Ashcroft calls the evil doing "bad guys." As noted previously, psychoanalytic theory posits that the evil doing others may represent the projected repository of our own unacceptable impulses and inclinations. It became quite clear in my own psychoanalysis and psychoanalytic training that it is in *healing our split* and knowledge of our own unacceptable things that will lead to our understanding and forgiveness of others.

As we dig deeper into global brain-mind dynamics of *emergent high-energy fixation, stuck repetitiousness and splitting,* we encounter their universality in the structures of mathematical thought. Did we just make them fit? Do these thought forms map onto internal and external physical reality? Are these abstract concepts and operations simply products of our biological brains manifested as psychological mechanics and used to explain to ourselves what we perceive and think? Does a square have external reality or is it a universally imagined something, and, as such, represented only in our minds and the pictures of it we draw? Is mathematical understanding simply inborn perceptual skills combined with developed and practiced logical cognition? Or, do we take the *Platonic view of mathematical relations*: these abstractions are the *ultimate realities,* antedating and persisting through the past, present and future of the universe and omnipresent.

Where can the conceptual boundary be drawn between the physical reality of the Babylonian surveyors use of the *Pythagorean theorem* to calculate distances, that the sum of the squares of the lengths of the two legs of a right triangle is equal to the square of the length of its hypotenuse, and its abstract, pencil-marks-on-paper, algebraic development as in the definition of *Pythagorean numbers, a,b, and c* such that $a^2 + b^2 = c^2$. The dichotomy between the abstract and concrete, consistently blurred in our work, is between a *natural science* with ideas that can be disconfirmed, directly or indirectly, by experimental observation and the thinking of mathematics as an *a priori field* in the sense of Kant. The modern Platonic view such as that held by Rene Thom is that once accepting a set of *natural givens*, called the *axioms*, the rest of the knowledge of this reality grows in the form of theorems that relate to the axioms and each other through their logical consistency. Knowledge of reality is moved by the ever-forward mathematical refinement of *a priori* conditions to *do away with the theorems' exceptions,* called *counter examples.*

The Hebraic Bible's view of *signifiers* such as words and symbols is close to, but not identical with, the Platonic view of mathematical formalism. According to the Torah, God made the word with words. God spoke and the world became real. The Aramaic for "I create in speaking" is *avara k'davara* , or as the magician says, as he waves his wand over an apparently empty black high hat, *abracadabra*. The Hebrew word for *word*, *davar*, also signifies *thing*. This view contrasts with the mathematical *formalists,* among them Hilbert, who considered the *signifiers of abstract mathematics simply symbols used in a game*, *the rules of which being arbitrary, must include proofs of consistencies among them.* Consistency from the point of view of physics was addressed by Hertz, in *Die Prinzipien der Mechanik,*(1894), where he expressed the formalist theoretical physicist's work as "...within our own minds we create images or symbols of the external objects, and we construct them in such a way that the logically necessary consequences of the images are again the images of the physically necessary consequences of the objects."

In another set of related contrasts, the *constructionist* mathematician will argue that mathematical assertions are only true if they can be demonstrated, found or constructed. In contrast, the *classical school* of mathematics can develop the case for the truth of mathematical statements if they are consistent with field's network of theorems and proofs, even if, up to the current time, no specific example of this truth can be demonstrated. The former can be thought of as a *builder*, the latter as a *discoverer*. For example, suppose we try to make a proposition about *perfect numbers* where a perfect number is defined as being equal to half the sum of its divisors. Using the perfect number 6, we find that its non-identity divisors are 1, 2, and 3 and half of their sum = 6. Our proposition: either there exists an odd perfect number, or else there exists no odd perfect number. An expression of this forced decision between yes and no is called the *excluded middle.* The *constructionist mathematician,* an orientation without the excluded middle, asserts that "an odd perfect number exists" would only be meaningful if one could show that such a number had been found or constructed. The *classical* mathematician would find the phrase "no odd perfect number exists" meaningful without a concrete example, if the assumption of its existence would lead to a no (versus yes) contradiction encountered in the proof-relevant network of established theorems and their relations. The symbolic operations of these formal schools of mathematics and their relationship to the objective and ideational realities of brain-mind-spiritual life have been viewed by some as Western cultural products rather than expressions of secular or spiritual Absolutes. Still others have argued that cultural relativism is not relevant here because mathematicians worldwide constitute a monoculture.

With respect to the real world existence of abstract mathematical structure, our Platonic bias must be obvious. The thrilling experience of a new reality I get to know from finally understanding how a theorem works and the rush of peering into the grandeur of the Grand Canyon feel like the same kind of full-of-wonder high to me. I blend them here without reservation. Perhaps this world of spiritual abstraction is closer to the orientation of the school of *intuitionist mathematics.* Its founder, L.E.J. Brouwer, required that every mathematical construction be so immediately apparent to the human mind that no formal proof was necessary. This became my form of *spiritual transcendence, which* led naturally to a *mathematical, mystical faith.*

We carry the explication of this kind of reality further. Reflections of the good and evil, right and left, moral directional biases and their relative weightings in *born again bifurcations* to *invariant circles* called *limit cycles*, can be symbolically represented in what are called the *complex eigenvalues* of matrices describing the system's set of orthogonal motions with changes in their control parameters. The behavior of these *complex eigenvalues* underlies and characterizes the mathematical mechanism of the *Hopf bifurcation.*

The subject of complex eigenvalues brings up in me the emotionally disturbing subject of *imaginary* and *complex numbers.* I can still feel a little of my earlier anxiety. The episode started benignly enough. Our high school's freshman algebra class was studying how to solve quadratic equations, equations in which the highest power of an expression was two. Told to work at the blackboard in front of the class, I was given the problem of finding the two values of x that were the roots of the equation, $5x^2 + 3x + 4 = 0.$ I had been taught to use the memorized *quadratic formula*, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, in which $a = 5, b = 3$ and $c = 4.$ I always calculated the square root part first and wound up with the expression, $\sqrt{9-80} = \sqrt{-71}.$ I can still feel the sinking feeling in my stomach as I looked at the result. I anticipated the usual snide remarks and embarrassment as I contemplated doing what I did not know how to do, *take the square root of a negative number*. Mr. Kirby, the retired mechanical engineer who was my high school freshman algebra teacher tried to help, but I did not trust him. It seemed to me that he had already humiliated me in front of the class, several times. He asked, "... what number when squared, multiplied by itself, would equal -1." He then asked it another way: solve the following equation for x: $x^2+1 = 0.$ Seeing something I could do, I wrote the next line quickly $x^2 = -1$ and then, taking the square root of both sides, I wrote $x = \sqrt{-1}$. He then asked me what that meant. I answered by writing quickly, glibly and blindly that that meant that $\sqrt{-1} \times \sqrt{-1} = -1$. He asked me to explain what that meant by giving him an example from the real world. Not yet knowing about imaginary and complex (combine real and imaginary numbers), I stood head down, ashamed and silent, thinking that my smart friend Jerry Blau would get the answer immediately. Mr. Kirby said he would go on with the class while I continued to stand in front of the blackboard and thought about it. He told me to interrupt him when I was ready to answer. Some classmates were smirking, others giggled aloud. They had seen him do this to me before.

Mr. Kirby, a short, muscular man, an ex-marine with a military haircut and a brusque manner, lectured that mathematical competence and obedience to authority and class discipline were all of a piece. I asked him about mathematical creativity and he said that this class was certainly not about that. I disliked and feared him. He seemed to feel (and wrote a note to my parents to the effect) that, being “too arrogant” I needed to be “brought down a peg or two.” I had gotten the best grades in the first two exams and was enjoying the role of after school tutor for some of my friends. I suspect I was getting pretty egotistical. In class, I found myself eagerly shouting out answers without holding up my hand, behavior that Mr. Kirby met with his characteristic look of fatigued disgust. Twice I was thrown out of class for my introjections. He then began to give me problems that I could not do, for which I was not prepared. This left me standing at the blackboard until the end of the hour, after all the rest of the students had solved theirs and sat down. On parent’s night, Mr. Kirby told my father that I needed more “social and intellectual discipline.”

Inspired and personally directed hard work and socially defined correct behavior were not synonymous to this arrogant 13 year old who had already brought chagrin to his mother, the conservatory classical piano instructor, with his satirical pianistic jazzy composition called “How High the Moonlight Sonata.” I was also a secret reader of the book on the top back shelf in my father’s library by Jack Hanley called “How to Make Mary; A Gentlemen’s Guide to Seduction.” In Mr. Kirby’s class, inspired by the book, I sometimes reached behind me, through the crack in my desk seat, to caress the inside part of the long smooth legs and sometimes moist panties of a well developed, tall and beautiful brunette girl behind me. I was never caught and she pretended that nothing was happening. In fact, she never talked to me outside of class. I felt then, vaguely, and now, more specifically, that a content enriched, instinctually titillated and excited unconscious could lead me to the solutions of intellectual challenges if it were both sufficiently indulged and untrammeled, left alone in its work of being itself. Mr. Kirby did not see things that way.

Since then, among my graduate and post-doctoral students in the neurosciences, I have learned that the Mr. Kirby’s of modern American educational practice have ruined generations of potential mathematicians and physical scientists. Worse, they have created generations of very bright math phobics who run to other graduate fields such as biology and medicine and come to resist the potentially humiliating incursions of new and potentially helpful abstract ideas and operations from mathematics and physics into their fields. They do not want their persecutory versions of Mr. Kirby to take up residence once again in their heads. I can still feel his negative presence during long hours of struggle with the ego deflating feelings of dumbness that an understanding of almost any new mathematical concept requires of me. Holding Mr. Kirby's voice off as long as I can until, sometimes, the wonderful "aha!" experience arrives. I have tried to forgive him since but forgetting him has not been possible.

It turns out that in the world of elementary, physically representative, real numbers, the *square root of a negative number* has no meaning. Such a number has understandably come to be called *imaginary.* Was this the answer Mr. Kirby wanted? There was some conflict among mathematicians in the 17th and 18th Century about the arbitrary definition of $\sqrt{-1}$ as an *imaginary number*. It was symbolized by a letter, *i*, that is $\sqrt{-1} \equiv i$. The existence of *i* extended the range of algebraic definitions so that a solution of the quadratic formula as above could be found for the square root of a negative number. A further expansion of this idea was to that of a *complex number* that can have both a real and an imaginary part. For example, letting letters be generalized representations of numbers, a complex number might be written, *a* + *bi,* real number *a* + real number b times *i,* the letters such as *a, b, c, d…* symbolized real numbers. Consistent with membership in an algebraic system, *a* + *bi* and *c* + *di* can be added and multiplied. This extension of the real numbers into the imaginary realm permitted d'Alembert's and Gauss's proofs (and many, more complete ones since) of the powerful *Fundamental Theorem of Algebra* from which the faith derives about always being able to find at least one solution to an algebraic equation. It was proven that *any n^{th} degree algebraic equation* (e.g. $x^n + x^{n-1} + ... = 0$) *with real or complex coefficients always has at least one real or complex root.*

Closer to an image that helps make *intuitive connections with human born again bifurcations, limit cycles and directional splitting* is the geometric interpretation of a complex number, let us now call it *z*. As above, algebraically, *z* is the sum of a *real part a*, plus b times the imaginary part, *bi*"; that is, $z = a + bi$. We can then set up a *geometric space* to represent *z* by imagining a *two dimensional plane* with the horizontal *real axis* extending from left to right, the usual x axis, and the vertical dimension, called the *imaginary axis*, extending from bottom to top like the standard *y* axis. These two axes, going from negative values to positive ones, left to right and bottom to top, cross at the shared value of 0. Thus *a* and *b* can be visualized as the rectangular coordinates of a point in the plane and the point locates the complex number, $z = a + bi$. Since real parts and imaginary parts are like apples and pears and for addition, like must be added to like, if two complex numbers, $a + bi$ and $c + di$ are equal, then $a = c$ and $b = d$ and their sum is written $(a + c) + (b + d)\, i$.

Now that we've set up a point *z* on the plane, located with a complex number at $z = a + bi$, we can then draw an arrow, called a *vector*, from the intersection of the imaginary and real axis at *0* to this point *z*. Its *length* from *0* to *z*, *0z*, we'll call that length ρ, is the size or amplitude-like *modulus* of the complex number, $z = a + bi$. The *angle* this *0z* vector makes with the real, *0a-axis,* lets call this angle ϕ, is called the *argument* of complex number $z = a + bi$. ρ *is a length that can grow or shrink,* ϕ *is an angle that can rotate.* We imagine vectorial movement like that of a variable length hand of a clock. This geometric explication of *complex numbers* prepares us to visualize *complex numbered eigenvalue* solutions to matrices representing the relevant equations that bifurcate to limit cycles and directional good and evil splitting. ρ represents the dilatable clock's radial amplitude of circular motion and ϕ, the angle of vectorial turning from the *0a-axis.*

The *complex conjugate* of the complex number, $a + bi$ is the complex number $a - bi$ in which the sign of the imaginary part is reversed. Geometrically, this means that a pair of complex conjugate numbers with the ρ's of both having below zero values relative to the *0a-axis,* that is *negative real parts*, could be imagined as the points indicated by two same sized, mirror image, clock hands pointing at 8:00 and 10:00 o'clock. Note that the ϕ, the angle of vectorial deviation of the arrow pair from the *0a-axis,* turn in opposite directions in these mirror image moving clock hand vectors. Without going deeper into the representation of the actions of the system in question (its differential equation) in the form of what is called its *Jacobian matrix of partial derivatives* (a matrix representation of the differential equation indicating orthogonal directional velocities of change of locations of the components of the motion with respect to changing values of the control parameter), we know that when the ρ of the matrix's set of two *complex conjugate eigenvalues* is less than zero, $\rho < 0$, the orbit representing the system, spirals into a *stable fixed point*. This is analogous to going to the *bottom of the parabolic attractor basin* as described above. *Values of the invisible eigenvalues and their changes constitute the abstract mathematical mechanisms underlying the observable dynamics of the system observable physically.*

The mathematical mechanism underlying the *Hopf bifurcation* of *fixed points* into *limit cycles* (associated with bi-directional splitting that accompanies the *amphetamine transformation* into limit cycle stereotypy of rigid ideas and equally likely mirror image motions in the directions of good versus evil) is the crossing of the systems real valued parts, ρ's, of its *complex conjugate eigenvalues* into positive territory, $\rho > 0$. The mirror image of clock arrows is transformed from 8:00 and 10:00 o'clock to the clock locations of 4:00 and 2:00. *At a Hopf bifurcation, a pair of complex conjugate eigenvalues crosses the imaginary (vertical) axis such that is real parts have positive value.* In the orbit representing the motions of the system itself, the fixed point disappears to be replaced by the action spiraling out to an *invariant circle*. This is analogous to our *manifold* image of the disappearance of the central attractive point and the sudden appearance of a small hill at the bottom of a *parabolic basic of attraction.*. The new attractor is an invariant circular path around the hill, with the *spiraling out to the invariant circle* being a two dimensional picture of the disappearance of the bowl-bottom and appearance of a missing point, hill top fixed point and a spiral flow to the path circling the hill. *Underlying the transition from a fixed point to a limit cycling, invariant circle, are a pair of mirror image complex conjugate eigenvalues that turn in mirror image, we could say, good versus evil, opposite directions. The Hopf bifurcating system inevitably has both.*

The implications of this *very abstract metaphor for the emergent limit cycle-splitting style* of spiritual transformation can be made deeper by considering the common practice of Rumi’s Mevlevi (and other) orders of Islamic Dervishes that facilitate the onset and maintenance of their ecstatic states by an improvisational dance which goes from rocking to irregular whirling. The Dervish teaching tales place a symbolic emphasis on the power of the rotating wheel, the circling of the heavenly bodies, the mill wheel and the millstone. As Rumi said, “The mountain of the sun I’ll fashion to a mill. And as my waters run, I’ll turn thee *at my will.*” Note that their work toward spiritual transformation results in neither the emergence of the involuntary and rigid limit cycles of invariant circles or the associated divisive internal eigensplitting of good self from evil other. The *Sufi compass points to an integrated field of divine consciousness, which contains the appearance of the world’s multiplicity. In this profound unity, all humankind is perceived as one family.* The singular direction of all prayer, Salat, five times a day, at dawn, high noon, afternoon, sunset and an hour after sunset, turns the entire world into a unified directional field of prayer. At its center, the Islamic pilgrims wander round and round the black cube of the *ancient shrine of Kaaba*,

This leaves one with the speculation that we started with: that the simple, authoritarian rules of the *amphetamine, roll-up and splitting religions* may be intrinsically more vulnerable to unpredictable breakouts into morally inconsistent actions and that the righteously rigid limit cyclists are invariantly split into ambivalence. In contrast, the more free form, *chaotic turns* of the entheogenic dervish define us all as belonging to one unified ecstatic field.

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CHAPTER 8:

FAITH AND RATIONALITY

It was my belief that, without subjective evidence of Holy Spirit Energy, the rush of reconfiguring transcendent experience, some glimmering of grace no matter how fleeting, an experience of intoxication with God, Martin Buber's self authenticating *I-Thou encounter*, the many good citizens of this world, without these moments of illumination, must be attending church or temple to negotiate a better now and hereafter. Attending synagogue or church without the promise of a mystical high seemed like a superstitious rabbit foot rubbing for personal health and safety and a sharing of propitious contacts for social and economic advantage. Why else?

I have had the good feel of what Jews call *Tzedakah*, the sharing of supplies by the haves for the betterment of the have nots. I have known the quiet calm of human right action as in the Unitarian Universalist's serving the needy, open and flexible, intimate mindfulness of others and their needs. Considering *E.O. Wilson's* brand of brain herd biology of *altruism* gives me a warm feeling about the potentially intrinsic goodness of man. But compared with the *Jamesian brands of ecstatic transcendence*, minds blown in Sufi twirling, Orthodox Jewish chanting, rocking and dancing, hands-in-the-air praying and hands-on-the-head healings of Wednesday night Pentecostal services, the soberly serious social engagement and responsibility sermons of Reformed Judaism and the Unitarians as well as the 19th Century hymns and high I.Q. apologetics of some Presbyterian and Methodist clergy, are like near beer. Formally equivalent but without the rush and the delicious risk and promise of life long addiction.

National opinion polls have found my preference for churchly fireworks in religious experience quite common. My Charismatic Christian sons are among the many with a preference for and loving labeling of these kinds of houses of worship as rock and roll churches. In a recent survey of Americans, 46% of respondents claim to be twice born, Evangelical Christians. Perhaps unfortunate with respect to their children's academic and professional ambitions, 48% do not accept a Darwinian view of biology. Fifty million American readers are now buying books with plots taken from the *Babylonian prophecies* and anticipate the *Rapture of Ret*urn with weekly, joyful, mini-rehearsals. They include praying in tongues as the Spirit moves them like Peter, John, James and the rest of the one hundred and twenty in the upper room on the day of Pentecost.

Those of us with two or more available cable religious networks can, on any given Sunday morning, choose a smiling, kind, Proverbs quoting, rational Presbyterian liturgical stylist. In his seventies, standing tall with a full head of white hair and in a quietly resonant voice, he delivers a sermon about seven ways to avoid growing old. His list includes learning new things and continuing to work. His spiritual proposal was about personal faith, always leaning on the Lord. On another network, the three hundred pound, restlessly pacing preacher of the Cornerstone Assembly of God Church of San Antonio, Texas, stood in front of large maps of Iraq and the Middle East. He preached from Ezekiel about the refleshing of dry bones and a return of all Jews to Israel. He said that contributions to his church over the past year helped finance the return of 4000 Russian Jews to Israel. He reiterated the promise that, when the return was completed, there would be a massive Islamic attack on Jerusalem and "we will all rise up to Heaven" in an ecstatic disappearance. Jews, as long as they accepted Jesus as their Savior, were welcomed along on the ride. More then two thousand parishioners erupted into loud applause along with shouts of "praise Jesus."

An inkling of something entirely different, neither human psychology nor frenzy, was an unanticipated benefit of being at England's Warwick University in sabbatical residence in Math House #2. This large, round, many windows and black boards, study with a small upstairs bedroom was one of the apartments for visiting professors behind the Warwick Mathematics Institute in the English Midlands. I attended a variety of churches and synagogues on the weekends. The perspective that emerged for me at Warwick was that rabbinic *Haggadah*, inferences to be drawn from imaginatively spawned narrative, isn't the same thing as *Halakhah*, the law dictated by Jewish legal tradition; that geometric insight and other intuitions aren't the same as mathematical proofs; that the mystical visions of the English romantic poet and illustrator, William Blake, were not necessarily consistent with the scientific observations and logical arguments of the contemporary Scottish philosopher, David Hume. Paul Tillich wrote that the wisdom attendant to primary spiritual experience that was without the unconditional character of sensible moral obligation was not to be trusted without critical analyses. I learned that among High Episcopal and Reformed Jewish English academics, God is not a hallucinogen, but more like a spiritually based, social contract.

In his 1929 essay, *Mysticism and Logic,* Bertrand Russell noted mysticism's preference for: (a) Insight over discursive analytic knowledge; (b) Belief in the unity of all things over oppositions or divisions in representational thought; (c) The denial of the reality of time, even in the divisions of past, present and future; (d) Belief that evil is unreal, manufactured by the innate divisiveness in some analytic intellects. In modern brain hemispheric and other neuropsychological philosophies, these countervailing descriptions of external observables can grow naturally out of the brain's abilities to *maintain logically incompatible perspectives simultaneously*. *Right-brain aesthetic holism* in contrast with *left-brain categorical analytics* recalls a popular example. Would one chose Blake or Hume to better explain how the time dimensions of memory disappear with the scent of a past lover or the hearing of his favorite music for lovemaking.

In the inevitable mix of primitive instinct with high purpose, the visiting professors' Math House #2 had an aura of infamy. It was the one in which, by the accidental intrusion of a campus security officer, the brilliantly eccentric Northern California mathematician, Ralph Abraham, was famously arrested for pot smoking. The campus officer told me that, late one night, thinking he had smelled fire, he used his master key to make an unwelcome entrance. The incident became part of the record in House of Commons hearings about the intellectual and moral decay of English Universities. Apparently, even among English intellectuals, there were trivial and politicized definitions of virtue.

Christopher Zeeman, the head of the Mathematics Institute was a world-class topologist who, among other things, demonstrated biological and social-psychological applications of Rene Thom's *Catastrophe Theory*. I was invited as a brain person and amateur mathematician, to see what might result from mixing me with members of his fine mathematics faculty. In addition to learning some bifurcation and lots of ergodic (statistical) theory, my chats with Christian and Jewish mathematicians on Saturday and Sunday morning visits to the synagogues and chapels of Oxford and Cambridge introduced me to an English intellectual's religious tradition. The spirit of C.S. Lewis was still very much alive. Surprising, however, was that more than a few of these scholars had the elements of Christian faith in full menu: virgin birth, incarnation, crucifixion, resurrection, original sin and the promise of salvation. I was disabused of my belief that these elements of Christian belief were incompatible with high mental capacity and intellectual sophistication.

Yet, the spiritual climate of these English intellectual Christians were different from today's post, post Vietnam return of the religious themes of the turn of the Twentieth Century, *big tent revivalism* and Billy Sunday's brand of *Christian patriotic America*. Today's religious patriotism infuses George W. Bush's Republican base, National Security Adviser Condoleezza Rice's after dinner hymns and Attorney General John Ashcroft's early morning bible study groups for his Assistant Attorney Generals. Even the most religious of my English math buddies are without what seems like adventitious baggage of today's faith based Republicans: the belief in the immorality and godlessness of teaching evolution in schools, what has been called the massacre of the innocents in stem cell research and abortion clinics, the right to bear machine guns and the intrinsically venal sinfulness of a man's commitment in love of another man. Was the clustering of these apparently diverse concerns the accidental result of a sociopolitical-religious short circuit, a class-resentment-driven spiritual split in geographic, socioeconomic and educational class? Tim LeHay is selling millions of books, whole tables full at Wal-Mart's, which come packaged with these assumptions.

Surely higher-level theists would make today's evil more subtle, abstract and pervasive, perhaps involving inner life themes of envy, vengeance and aggression; goodness implicating empathically made moral choices involving interpersonal kindness and evidence of caring about the well being of others. My contact with some English academicians taught me that even the mathematics of hard science can be viewed as a gift of grace and belief in the possibility of a continually emerging, Christ-centered, evolutionary process. Protestant philosopher mathematician Alfred North Whitehead in his 1926 *Religion in the Making*, Catholic anthropologist priest, Pierre Teilhard de Chardin in his *The Phenomenon of Man* and the more modern *process theologists* of New York's Union Theological Seminary do not exclude Christ's involvement in evolving science and other new knowledge. They see Him participating in a spiritual evolutionary progress which does not gather the barnacles of irrational ideas about the murder of less than hundred-cell blastula or the psychoneurohormonally determined sexual partner preference. They know about the ever-changing cultural and political appearances of faux and real evil. Nonetheless, what I learned from my Christian and Jewish friends at the mathematics institute was that, though the definitions of evil may change, evil as a construct and spiritual mechanism is an apparently essential component of the Christian experience. On Rosh Hashanah, even the reformed Jews commit themselves to *Teshuvah*, making up for past evil deeds. The good versus evil dichotomous view of man's existence is true in the lives of Assembly of God Fundamentalists of Georgia as well as the sophisticated Readers, Professors and Dons of the high Episcopal churches and university chapels of Oxford and Cambridge.

Finding high-level mathematical thinkers at home in metaphysical surrounds and metaphysicians diligently practicing mathematics are certainly not new. Some instructive examples include, famously, the Pythagoreans, the 15th Century Catholic Cardinal Nicholas Von Cusa, who used geometric symbols to record his spiritual philosophy, and the Talmudic-Cartesian style of argumentation of Nicholas de Spinoza. This approach to an examination of metaphysical systems, sometimes called *mathematicism*, exploits the machinery of the mathematical mind to evaluate the consistency and completeness of thoughts, to create *representative axiomatic structures* and to operate within them using *syntactic calculus*. The practice of the rational dialectic of mathematicism, working for moral purity of heart, develops a brain-somatic discipline much like the exercises of Yoga.

This approach flies in the face of the major premise of these essays, my belief in the necessity of what William James and others have called the *primary religious experience* in order to know God. Recall that my father's favorite Jewish mystic, Abraham Abulafia, said this experience gives birth to an *activated mind* that can then immediately and completely inform the Spirit. Among the religious English mathematicians, I learned that it doesn't have to happen this way. One can apparently think oneself to It. A well known example of a modern theistic Oxford type, the Magdalene College English tutor and Don, C.S. Lewis, in his introduction to St. Athanasius's *The Incarnation of the Word of God,* wrote, "…I believe that many who find that nothing happens when they sit down or kneel down with a book of devotion, might find that their heart would sing unbidden while they are working their way through a tough bit of theology with a pipe in their teeth and a pencil in their hand…" In contrast, without my personal experiences with joyful transcendence, the direct feeling of His presence, I would not have known about the goals of his more analytic efforts. It was a struggle for me to use a rational mind to share the meanings of the poetic ruminations in his BBC lectures, *Mere Christianity.* This Reader from Oxford with two firsts in Latin and Greek followed by another first in English Literature, described the world as "…enemy occupied territory…" the omnipresence of the Good Power turned Dark Power of the Prince of Darkness and the Christian as "…a man who is enabled to repent and pick himself up…"

For C.S. Lewis, religious faith came from intellectual hard work. He was put off by spirituality that arrived by thoughtless fiat. He rejected the idea of living in simple and loving direct conversation with the God within, as described by Brother Lawrence. Lawrence was described as the simple "great awkward fellow who broke everything." Lewis had little faith in what he perceived as the mindless spiritual methodology of this selfless, silent, hard working Parisian monastery cook for a hundred fellow monks who was also their dedicated smelly sandal repairer. Perhaps reflecting his place in the British intellectual class system, Lewis wrote that Lawrence's conversations and letters in the brief pamphlet, *Practice of the Presence of God*, "…full of truth… but unctuous and repulsive." At the same time, Lewis spoke of his own experiential evidence for God in *Surprised by Joy* in which he admits, "I am an empirical theist. I have arrived at God by induction." It is likely that Brother Lawrence did not know and did not need to know the difference between an inductive and deductive argument.

For most of my years, I have been a subject of Jamesian transcendent experience, LSD expansive visions, Sufi moving meditation, long distance running, Black Baptist shouting, Tantric orgasmic withholding, Yiddish Labovicher dancing, Charismatic Christian Church rock and rolling, Hindi meditative rising Kundalini, almost any ecstatic crisis inducing, God type. Recall that I am from a generation that a Donovan song inspired to smoke bananas. I did not personally access Brother Lawrence's calm, work-a-day, devotional, quietly persistent, perspective yielding, inner conversations with God until my sixth decade. The opportunity came from my growingly severe, unfixably chronic, pain. The counter-intuitive insight and helpful identification was gained from reading about Joseph de Beaufort's conversations with Brother Lawrence. Beaufort said Lawrence was born with the name Nicholas Herman in 1611 and renamed Lawrence in honor of his parish priest. As young soldier in the Thirty Years War of the 17th Century, he was severely injured. He was left with both sciatic nerves trapped between bone spurs and tissue scarring from his early twenties. These injuries, involving the two biggest pain-conducting nerves in the body, left him crippled in gait and in chronically severe lower back and leg pain from which he would never be free. It was after this time and a few years of looking for God in what he called “wondering in the wilderness” that he began his 40 years of monastery service as cook and sandal maker. He was described as amazingly selfless and a “…gentle man of joyful spirit…” who “…continually walked with God…not from the head but from the heart…” Doing long hours of selfless work with such painful disabilities, how was it that he maintained his joyful, loving and calm contact with God and his fellow man? How did he do it? I found that, as with all miracles of God contact for me, it happened by itself.

I suffered my first testicular cancer in my thirties. I felt the little hard rock by accident while scratching. It was on the left side. Surgical removal was followed by a five-hour radical abdominal lymph node dissection that left me with incidental abdominal sympathetic nerve damage, urinary hesitancy and ejaculating backwards into my bladder. The tissue diagnosis was of embryonic cell carcinoma with chorionic elements. The U.S. Armed Service Pathology Department’s statistical book gave me 5% chance of living beyond two years. My second testicular cancer occurred in my fifties and on the right, two little joined lumps found by my wife. It was a seminoma with cure rate of 85% but requiring four weeks of almost daily x-ray treatment. The combination of radiation induced blood vessel scarring (they had to blast widely since my earlier lymph node dissection confused the usual radiological anatomy), a pre-existing laterally curved spinal column and the arthritic changes resulting from fifteen years of running over 10 miles per day with this kind of back led eventually to the degeneration and collapse of several of the bodies of my vertebrate pinching several leg nerves between bone spurs and radiation-induced scarring. I have been in increasingly severe back and leg pain for fifteen years.

It was in this way that I fell heir to both Brother Lawrence pain syndrome and what I now think was his strong inclination to live in the Spirit, as far as possible outside the concerns with his own mental and physical body. In my experience, this led naturally to a decreased in my life long narcissistic preoccupations, diminished my ego-driven achievement desperation, setting up a more comfortable inner seating for conversations about and with God. The choice was between fully embracing a God-oriented place for most of my daily existence or the chronic use of enough narcotics to eliminate complexity of thought, real interpersonal feelings and hope for meaningfully creative work. The remarkable thing to me was that people began to talk about my “improved disposition,” an increase in out-of-my-psychiatrist’s office personal empathy and kindness as well as a significant decrement in my overweening, ego-stoking ambitious and competitive urges. Any return to the earth body of tense readiness to competitively succeed, protect with ego defensive anger, fantasies of assertive sexuality, stand tall grandiose notions of intellectual superiority, even getting up for scientific combat, was accompanied by the return to this world of pain. Only lovingly detached, unpretentious, other directed, quietly calm inner dialogue with Him was a place that I could live. This was an inner land of still another kind of God than I had previously known. I could even read and struggle with theological ideas thoughtfully, without referencing personal mystical, psychopharmacological, Holy Ghost-mimetic, experiences. I could enjoy the rational, social responsibility valuing, spiritual peace of a white Protestant Sunday morning service. I could attend Reformed Jewish Friday night services about man’s responsibility to man without restless boredom. No longer seeking the feeling of God’s thrill, I could think about it, even without being in the state of my father’s and Abulafia’s *activated mind*.

If I had been benefited with a classical language education beyond the high school and early college Latin of Julius Caeser and Cicero or matriculated in an academic theological seminary, I would have already studied, maybe even worn out, the deeper aspects of what seemed like a paradox of the *consonance of faith and reason*. I would have been familiar with the rhetorical argumentation in the patristic Latin commentary on sacred texts by Tertullian and other Fathers of the early Christian Church, the Talmudic discussions (the Mishna in Hebrew and Gemora in Aramaic) of the oral Torah by the Rabbinate, the Muslim explication of Koranic Islam in the oral tradition of the Hadith. Robert Wilken in his recent *The Spirit of Early Christian Thought* was in no doubt about the harmonic relationship between rationality and faith: “…by putting itself in the service of truth, faith enables reason to exercise its power in realms to which it would otherwise have no access…" It is perhaps strange to come to this common knowledge so late, but I came to my life with my forbearers and father's magical, mystical biases.

My father had parodied what he thought was the "wasteful time" spent in rational, Talmudic discussion. He said that is what Jewish men spent their time doing to avoid physical work while sitting near the city gates. It was the women who raised the crops and cared for the cattle and children. He had a favorite conundrum satirizing the village gate discussions. Jewish males, after the age of thirteen, accompany their morning prayer of commitment to loving and serving God with the ritual of wrapping scripture embedded animal skin, *tefillin,* and winding them seven times around the left arm, near the heart, and around the head, symbolizing the mind. This contextualizes how my father made fun of a typical topic of these all male Talmudic seminars: "If one had seven arms, would one wrap the *tefillin* once around each appendage or seven times about one of them. If the latter is the case, how would one chose which one." In fact, there remains an on-going debate about the order with which the embedded four passages from Exodus and Deuteronomy should be arranged and inserted in the *tefillin* such that some compromising orthodox Jews wear two types of *tefillin,* each representing one of the theoretically justified orderings. I know now that there is an implicitly positive confirmation of a jointly held faith and feeling of ethnic belonging achieved by such apparently abstract discourse and argumentation.

In truth, I had not come to Warwick to explore the relationships between faith and rationality using the cognitive style of mathematicism, but rather to be saved by the mathematical miracles of the Brain God. Not unrelated to what C.S. Lewis saw as a prominent characteristic of spiritual experience, "wonder," and what Philip Davis and Reuben Hersh in their 1981 book, *The Mathematical Experience*, spoke of as "beauty" and "surprise." I know about the attack of excitement that comes with the sudden emergence of counterintuitive conceptual connections while exploring new mathematical ideas. In energetic high, I start skip reading, underlining the book frantically, jotting commentary on the margins, copying the relevant equations into my notebook. Was this the same break through to a glimmering of grace, everything beautifully in order and precious, that I experienced on LSD while sitting for hours inside Paris's towering, echoing, Notre Dame Cathedral, hearing Latin chants in the dank sweet smell of old church and chained, swinging canisters of smoking incense as the pipe organ roared? Those realities that George Berkeley, the 1721 author of *Treatise Concerning the Principles of Human Knowledge,* the theist whose name was given to a mostly agnostic Northern California city, saw as grounded in the spirituality of God's infinite mind and broadcast as universal ideas through our derivative, finite minds. Rational religion and mystical religion joined in faith by the presence of implicit and universal mathematical structure

I spent about two years at a mathematics institute in France, *Institute des Hautes Etudes, IHES,* sitting at the guru feet of the mathematical great and metaphysician, Rene Thom. His mathematical pallet was breathtakingly broad, a taste of what in past centuries was called *natural philosophy* and what seemed to me to be about the unapologetic geometrization of the Intuitive God of the Mind. Natalie Angiers, erstwhile mathematician, now reporter and atheistic hard ass, writing in the New York Times, called Thom's ideas the talk of "...an Emperor without clothes..." The Kantian theme of the personal *a priori* status of an intuitive geometry, an already in us representation of all that's out there, was implicit in his *Catastrophe Theory* research program and was published first in his classical *Structural Stability of Morphogenesis* (1977) and made more overt in his later (1990) *Semiophysics.*

To get a feeling for the rational-logical versus mystical-intuitive spiritual issue in a mathematical context, consider the following: most of us remember the struggle to unify the strange and difficult cognitive duality of the high school geometry experience. On one hand, shapes and their relations and rearrangements could be intuitively grasped, even manipulated; on the other hand, we were taught that these mental images and the results of their intuitive transformations were not to be trusted.

In mathematics, as in my belief in the fireworks of primary religious experience, seeing is not necessarily believing. In my high school geometry class, what was to be believed was what followed from the proper practice of the tightly organized, Euclidean system of axioms, postulates and the derivative logical operations resulting in the surety of proofs. The unresolved tension about what I believed from intuitive experience and what I was allowed to believe from the logic of theorem and proof, perhaps not unlike my belief in the transcendent experience over logical theological argument as Reality, continued throughout my life. For example, many decades later at *IHES,* I saw the world class dynamical systems theorist and differential geometer-topologist, Dennis Sullivan, use a projector to display a computer-generated, intricate and beautiful, mathematical object, the well known, computer screen saver, *Mandelbrot set*. It represents the control parameter plane of the well studied *complex analytic map,* $z \rightarrow z^2 + c$. Sullivan, pointing to a small, discrete complicated little part of it that looked like a little version of the whole of it, from a distance looking like a point, said, “An important Ph.D. dissertation is waiting to be done on the question: is this (pointing to the little object) really there?” In the audience of about a hundred professional mathematicians and one amateur, I was the only one that laughed.

Historians of mathematics point to the successful generalization of Euclidian geometry via its abstract axioms, postulates and logical operations to a new, not naturally intuitable, almost nonvisualizable, *non-Euclidean geometry* (with the new geometric axiom, *parallel lines do meet at infinity*), as evidence against the Kantian idea of the intuitively accessible, *a priori* status of geometry. This served as an example of where mathematics naturally resides, and argues in favor of the thought control imposed by the modern set theoretic and logical rituals of mathematical theorem and proof. Thom, in a hereditary-evolutionary biological argument developed in *Semiophysics*, said “Objections raised to the Kantian apriority of Euclidean geometry after the discovery of non-Euclidean geometries, and the theories of twentieth century physics (restricted and general relativity, quantum mechanics) appear to me to be irrelevant…they deal with …the infinitely small and infinitely large…which lies outside the usual cognitive activity of ancient man.”

In my discussions with him, Thom found equivalence relations between mental and real world objects and their behaviors. He described what he called an abstract *physicalist* truth that describes a *psychic universe*, which, in turn, simulates outside things and processes. Much like the transcendent experiential God I have experienced, seek and think I know about, Thom was not after the logical proofs of geometry but rather viewed mathematical theorem and proof work as activity *derived* from intuitive experience with geometric relations as the thought forms that represented *real Reality*. Though a Field's Medal winner in mathematics (recall that it is the Nobel Prize in mathematics awarded every four years at the International Congress of Mathematics) and for his life time, one of the most brilliant and fecund mathematicians in the world, so many mathematicians admit that they got the seeds of their life work from his throw away remarks, Thom, with a little smile and his eyes twinkling, admitted to me with apparent pleasure that "I have never proven any theorem in my life." All his discoveries came from insightful moments of grace and the courage to pursue them. Riding back from Paris late one night on a train that didn't stop at *IHES's* town of *Bures sur Y'vette,* I watched him use the red emergency phone to call the train's engineer to stop the train suddenly for our exit. I loved him, in part, because he had the courage to believe in and act on my kind of intuitively realizable, experiential God.

In keeping with his characteristic style of generalizing mathematical systems beyond their carefully defined specifics, Thom defined the concept of *singularity* very broadly, speaking of them as distinctive and noteworthy things, points *where the usual or expected properties, laws and definitions fail, where smooth and continuous processes become discontinuous.* For Thom, these were the *settings for the unexpected and miraculous*. He believed that his work and that of many others, now and in the future, would indicate that the *set of miraculous singularities were finite*, *systematic, universal and describable*. Most importantly for our purposes, Thom believed them to be *archetypal. It was through the structure of archetypal singularities that he regarded inside and outside realities as mutually reflective*.

I was blessed by hours of discussion with him during his car travels to lecture around France. Thom often asked me to accompany him as he drove from *IHES* to various branches of the University of Paris. He used these times to exercise my geometrically flavored, mathematical intuitions. He used words to create visualizable structures without the diagrammatic aid of a blackboard. He used mental topological structures created by the properties of imagined motions, *flows*, which led to examples of some of his universal singularities that he claimed could be found in all real physical, biological and psychological systems. For some examples: One of his archetypal singularities was a *boundary* at $x = 0$ such that the *flow* couldn't spread from where it was in $x \geq 0$ into $x < 0$ and was therefore like the border, the membrane, between the inside and outside of a cell as well as the hoped for sociopolitical functions of the Great Wall of China and the Maginot Line. If we were to blow up the boundary line from two to three dimensions, $R^2 \to R^3$, the straight boundary line becomes a *cylinder* for directionally organizing and connecting flows as in blood vessels, oil pipes, cables and wires. Since production and delivery need not occur at similar rates, temporary storage is required and may take the form of a spherical blow-up in the vertical segment of R^3 leading to an open *bottle* which may serve as a dead end storage branch of a network of connected cylinders. In the conceptual reductionism of *Semiophysics,* Thom said, "…life is essentially a question of embankment, canalization and the struggle to stem dispersion." These structures of mind and world are built and maintained. Coagulation of blood is an example of a canalized fluid repairing gaps like a tubeless tire. Thom considered apparent the problem of *making something from nothing*, *birth*, that of finding the *hidden sources*: the bubbling spring emerges from an unseen, underground network of canalized fluid flow converging on the apparent source, birth being the invisible becoming visible. In contrast, a canalized flow emptying into lake can represent disappearance as a flow.

Mathematicians from all over the world attended Thom's 65th birthday celebration at *IHES.* His Field's Medal winning work on the topology of *differentiable* (*smooth*) *manifolds*, *cobordism* and related ideas, was mentioned frequently, and great homage paid to him with respect to these areas of his work. However, in two days of lectures of personal and professional tribute by the world's great mathematicians, his work relevant to *Catastrophe Theory* and *Semiophysic*s was not mentioned, even once. The form taken by mathematicians' most severe judgments is silence. As the New York Times' Natalie Angier's comments indicated, this is not the time for the intuitive conduct of applied mathematics.

It was upon Thom's recommendation, that I spent the year in the Mathematics Institute in Warwick, England. Using the Math House #2 s home base, I made many trips to Oxford University and a few to Cambridge. It was in these places that I learned first hand that belief in the Resurrection was not simply a matter of socioeconomic class. I tried to schedule my trips to Oxford or Cambridge to coincide with the weekend so I could hear the remarkably literate sermons at the Universities college chapels. In these places, for hundreds of years, just because one was a top-notch practitioner of mathematics or linguistics did not mean that the Don did not have within him the full panoply of beliefs attendant to the Christian God.

Maybe this easy combination of logic and Spirit derives from the character of English mathematics. There are graduates with professorially enfranchising Masters of Art Degrees in Mathematics from Cambridge University where the subject is considered by many to be part of the culture of the humanities, closely akin to philosophy and linguistics.. In the universities of United States, for example the Massachusetts Institute of Technology, an academic degree of Ph.D. in mathematics is seen by most faculty as an indication of the intellectual equipment required for a life of scientific work in which disconfirmable experiments are the ultimate criteria for knowledge. The field of pure mathematics (not ostensibly relevant to the real world outside the mind) has itself evolved in this direction. Recently, a physical scientist, a theoretical physicist, Edward Witten, was given the mathematician's ultimate award, the Field's Medal. In American universities in general, very few mathematics departments are in schools of the humanities. Most are in the schools of science. This variation in bureaucratic, metaphysical, sorting reflects our continuing struggle with the true nature of reality and the role of mathematics in its knowing. The now emergent field of computer science removes mathematics even further from intuition and Spirit. Difficult problems such as proofs of theorems can be systematically examined for all possibilities quickly by trying them out in what is now known as a *computational proof.* On the other hand, pointing at this computation's graphics, the theorem and proof, real mathematicians can ask, is *this really there*?

Mentioned briefly above was one of humankind's beacons, Pythagoras, the intellectual and spiritual progenitor of Plato. He taught the disciples of the *Pythagorean Brotherhood* in Crotona, Italy, that reality at its deepest level was mathematical thought. Studies there included philosophy, geometry, music and astronomy, all at the service of achieving closer union with the Divine. Pythagoras and his school, only his student's writings remain, was said to be working at unifying elements of the ancient tribal mystery cults with the observables of worldly events through meditative, mathematical, philosophical mysticism. Knowledge was gained through spiritual intuition made harmonious with formal systems of thought. As Plato later said and as quoted by Thomas Heath in his 1921 *History of Greek Mathematics,* about the study of the motion of stars, "…leave the heavens alone…" because what one sees is only an approximation of the real and more perfect mathematical structures involving *points, lines and circles*. To which Newton added an *elongated circle, the ellipse*, and Nineteenth and Twentieth Century mathematicians and physicists, the *geometries of positively and negatively curved space.*

It is perhaps not an accident that debates about evidence for the existence and location of God and where the ideas and structures of mathematics live and breath generally involves a stand off between those that believe that both are out there and can be seen, like thoughtful, humanistic actions and caring service for needful others, versus those that feel the phenomenology of both are projections of the psychobiologically intuitive Brain God and can be felt like an ecstatic rush of insightful illumination.

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APPENDIX

AN INTUITIVE GUIDE TO THE IDEAS AND METHODS OF DYNAMICAL SYSTEMS FOR THE LIFE SCIENCES

Arnold J. Mandell and Karen A. Selz

Biological Scientists Can Understand and Use Ideas and Methods of Nonlinear Science

A yield of advances in computer hardware and software is that even quite difficult applied nonlinear mathematics can become accessible to experimentally oriented biological scientists. Before this time, the development and analysis of a particular set of nonlinear differential equations, describing the actions of a neurobiological system in motion, involved decades of specialty training, rare insight and many hours of highly skilled, trial and error computations by hand. Since the idiosyncrasies of each nonlinear system were considered unique, the results of their analyses were thought to concern only the particular nonlinear system being studied. Often a shift in hypothetical mechanism meant starting the long and painful process all over again. In addition, these findings were usually communicated only to a small and arcane mathematical community in the form of dense theorems and difficult to follow proofs, insurmountable language barriers to biological researchers wishing to use them to better describe and understand their experimental observations.

For today’s neuroscientist with a desktop computer, an inclination to program and access to computer algebra and numerical software such as Maple, Mathematica or MatLab, operational definitions and computational empiricism can replace the theorem and proof continuity required to do old style applied mathematics. For those of us without sufficient facility in algebraic manipulation to easily follow the arguments of professional mathematicians, a computer algebra program such as Maple serves as a delightfully accessible consultant with which to “check out what the guy is saying". Those motivated enough to write their own data generating or analytic programs in C, Fortran, Pascal or Basic (though not essential) can find easy-to-use algorithmic help in Cambridge University Press's Numerical Recipes series (Press et al, 1991).

The conceptual and communication gaps between applied mathematicians and physicists and the bench practitioners of the neurosciences, that inevitably lead one or the other, most often both, to surrender their deepest intuitions to jointly shared images that are inevitably more simplistic, are no longer inevitable. With her own hands on both the quantitative conjectural and experimental machinery, the motivated practicing neuroscientist can honor her own insights, read about and construct symbolic representations from her intuitions and do her own quantitative theory. Computerized numerical techniques have become so powerful and accessible that, even in academic settings, there is debate about whether fundamental analytic tools, such as series expansions, should be taught in undergraduate courses about differential equations.

The practice of "try it and see what happens", with the current name of experimental, computational mathematics, is accessible to all. In addition to the powerful general mathematical programs noted above, there exist several sets of more specifically targeted software with the capacity to generate, portray and quantify the behavior of nonlinear continuous and discrete abstract and real dynamical systems. These often also include algorithmic modules that are useful in tailoring new models and measures (see for examples, Parker and Chua, 1989; Baker and Gollub, 1991; Nusse and Yorke, 1991; Sprott and Rowlands, 1991; Sprott, 1993; Korsch and Jodl, 1994; Enns and McGuire, 1997). Learning from and using this software, along with only a little programming in the high level languages and computer algebra programs listed above, permit the non-mathematician neuroscientist, willing to read in the literature such as that described below, to do independent, cutting edge research in applied dynamical systems.

Described below will be the computational discoveries in abstract systems and real neuroscientific data that have led to multiple contexts of quantitative description. These include those that are: (1) Geometric and conserve metric distances; (2) Topological and conserve relative positions but not distances; (3) Single or multiple global quantitative descriptors such as scaling numbers or scaling number spectra; (4) Non-Gaussian distributions with heavy tails and correlations reflected in their Hurst, Fano, Allan and Levy exponents; (5) Statistical dynamical descriptions of trajectories of the system in their embedding space such as Lyapounov exponents, Hausdorff-Mandelbrot dimensions, Sinai-Ruelle-Bowen measures, and Adler-Weiss-Ornstein topological and metric entropies.

Characteristics which discriminate between experimental versus control conditions in parametric computational and real physiological and pharmacological experiments serve to generate and test ideas and imagery arising out of behavior observed in both biological and abstract dynamical realms. New experiments can be suggested by the implicative structure of dynamical systems theory as well as neurobiological findings and intuitions. As examples, the sudden “switch” of manic-depressive bipolarity syndromes may be a “bifurcation” in nonlinear dynamical systems; the “noise” of the statistical physicist may be the “arousal” of the brain stem-thalamic biogenic amine and reticular formation neurophysiologist; aspects of “thought disorder” in the pathophysiology of schizophrenic patients may be an entropic sequencing idiosyncrasy in the “symbolic dynamics” of a particular brain system attractor; neuronal “bursting” may be the “intermittency” of a neurodynamical system; a multiplicity of “discrete ion channel conductances” may be a single “global scaling hierarchy” of conductances times. The number of published examples of this fusion of ideas and methodology in the biological-relevant literature is already in the several hundreds and Medline counts indicate is growing exponentially. Representative samples of these are described below.

In addition to the technological advances in computational hardware and software, the major scientific surprise making this new era possible is the discovery of universalities, the finite set of behaviors characteristic of most, if not all nonlinear systems, across most if not all of the specific equations or neural systems being explored. This makes the emergence of semi-quantitative equivalence relations between model and data not only possible but likely, even though we don’t now and perhaps never will know enough to either write or solve completely the specific and detailed equations for the biological system of interest. We neuroscientists need not be apologetic for using these ideas and tools qualitatively and empirically. In fact, unanticipated results of analog and digital computer experiments were responsible for most if not all of the discoveries underlying the current era's revolution in applied nonlinear mathematics

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Modern Applied Dynamical Systems Emerged from Accidental Computational Discoveries

A medical student named Herr, in his thesis research with the "radio engineer", Van der Pol (1926), was simulating cardiac electrophysiology with an analog device which permitted real time, exploration of a full range of parameter values long before there were fast enough digital processors to do so. Studying the behavior of equations of a periodically, pace maker, driven, nonlinear triode oscillator, Herr found orbital points that appeared to belong to two different periods simultaneously thus violating the uniqueness of solutions of differential equation theory. The Van der Pol relaxation oscillator equations, with their slow buildup and sudden discharge of membrane potential are good models for the slow-fast processes of repolarization and depolarization of Hodgkin-Huxley type equations (Rinzel, 1985). Periodically driven, nonlinear differential equations of the Van der Pol type are generally applicable to the multiplicity of dynamical regimes of neuronal dynamics (Carpenter, 1979; Aihara et al, 1984; Chay and Rinzel, 1985) and, with periodic and aperiodic driving and noise, can be made relevant to particular mammalian neuronal subsystems in the context of clinically relevant global electrophysiological phenomena such as Magoun's (1954) brain stem evoked EEG and behavioral arousal (Nicolis, 1986; Selz and Mandell, 1992; Mandell and Selz, 1993).

In the early 1940's, using the pre-publication results of similar analog computer studies (Levinson, 1949), the Cambridge mathematicians, Mary Cartwright and Joe Littlewood (1945; McMurran, S., Tattersal, J.,1999) used geometric methods to prove that the highly nonlinear, periodically driven Van der Pol equations, depending upon one or two changing parameters, generated fixed point ("homeostatic"), periodic ("cyclic"), subharmonic ("period doubling"), quasiperiodic ("multiply periodic"), intermittent ("bursting") and "deterministically random" patterns. We now know such phenomena to be universal characteristics of bifurcation scenarios in nonlinear dynamical systems where bifurcation means discontinuous changes in patterns of behavior (dependent variables) resulting from smooth changes in parameters (independent variables). Alerted to their presence in computer experiments with biologically relevant nonlinear differential equations, these phenomena have since been found in time series from patch clamped membrane channels, single neurons, neuronal networks, neuroendocrine systems, brain waves and patterns of behavior in animals and man (see below). Cartwright-Littlewood found that the inner and outer edges of the domains of attraction (all the initial values that eventually wind up in the attractor—the limit set of all bounded solutions) of two different sets of subharmonic periods for the same parameter settings were interlaced at many scales in what is today called a fractal basin boundary. It was in this way that the specific values of the end state are understood to be indeterminate since the starting values in the fractal basin boundary are impossible to isolate and specify with adequate experimental precision.

Similar biologically-relevant analog computer discoveries about the Van der Pol and comparable periodically forced, dissipative (energy utilizing) Duffing equations (Zeeman, 1976) were made in the early 1960's by electrical engineer, Yoshi Ueda (1992), but his thesis director, Chihiro Hayashi of Japan's Kyoto University, was sufficiently disturbed by this evidence for the existence of bounded solutions (attractors) that were neither fixed points (equilibria) nor periodic orbits (cycles), the only ones known at the time and therefore "strange," that he refused to let Ueda publish his findings until he did so as an independent investigator in the 1970's.

In the early 1960's, Edward Lorenz (1963), a meteorologist and student of the Harvard mathematician and dynamical systems pioneer, George Birkoff (1922), was computing the output of a very reduced subset of Saltzman's differential equations for predicting the weather (1962). Lorenz found that numerically integrated trajectories manifested unpredictable times and directions of motion between the two spiral orbits of what has come to be known as the Lorenz attractor. Very small differences in starting values led to widely diverse final values, and, just as importantly, far apart initial values could be found close together in the limit set. This behavior was called “sensitivity to initial conditions” by David Ruelle (1978; Ruelle and Takens, 1971). It is noteworthy, however, that over a range of values of the parameters, the overall pattern of the orbits of the Lorenz attractor results in characteristic geometric pictures as well as invariant statistical descriptors. Qualitative and quantitative global similarities were gained while specific solutions were lost in these “strange attractors” of nonlinear systems. Analog computer simulation of a simpler set of equations inspired by nonlinear chemical reaction kinetics led to the discovery by Rössler (1976) of another early and generic strange attractor combining sensitivity to initial conditions and characteristic geometries and measures.

It was the Russian mathematicians, A.N. Kolmogorov (1957), Sinai (1959) and V.I. Arnold (Arnold and Avez, 1968), the French mathematicians, Rene Thom (1972) and David Ruelle (1978) and the U.C. Berkeley mathematicians, Steve Smale (1967) and his student, Rufus Bowen (1975), and their associates who gathered together these and other related computational discoveries and embedded them in a qualitative theory of nonlinear differential equations, using a variety of formalisms, including point set and differential topology, geometry, analysis and ergodic (having an invariant statistical description) measure theory that formally established the fundamentals for research in nonlinear dynamical systems. Here a dynamical system refers generally and simply to the components and nonlinear processes (transformations) that move points (values) in discrete (“map”) or continuous (“differential equation”) time around in an appropriately defined space. The phrase, “nonlinear transformation” in this context does not imply easily solvable curved functions, such as those representing the sigmoid kinetic or threshold functions of enzymes and neuronal networks or those that smoothly log transform the amplitudes of auditory or other sensory modalities in man, but rather allude to expressions containing products, powers and functions of the computational and/or experimental variables x_i, such as $x_1 x_2$, $(x_i)^3$ or $\sin(x)$.

As noted above, the cross-disciplinary cohesiveness of such a vaguely defined field occurred as the result of the unanticipated discovery of a relatively small set of nonlinear phenomena, universalities, that implicated many fields of mathematics, from differential geometry to number theory, and were found in a broad range of physical and biological realizations, from turbulent plasmas and chemical and enzymatic reactions to neuroendocrine hormone release patterns. It is perhaps counter-intuitive but, whereas linear systems can generate an infinite number of solutions locating points anywhere the person writing the equations wants them to go, nonlinear systems are generally restricted to a finite set of global dynamics and these emerge on their own from the intrinsic dynamics of the system. Trying to make these systems follow orders, not unlike finding the most clinically effective dosage range of a psychopharmacological agent, require the empiricism of trial and error experiments.

A second class of computational accidents involving nonlinear systems resulted in unanticipated coherence rather than unpredictable disorder. Using one of the early "high speed" digital computers at Los Alamos, MANIC I, Enrico Fermi with Pasta and Ulam (1955) attempted to obtain a many-body statistical thermodynamic equilibrium analogous to heat generated noise by coupling 64 particles together with nonlinear springs. They found only a few low period modes that oscillated indefinitely. Instead of equidistribution of the energy into 128 degrees of freedom (64 locations × 64 velocities in 128 dimensional phase space), they found it gathered up into only few coherent modes. Although the relevance to biological science of nonlinear multifrequency coherence is a bit off from our focus, it is worthwhile noting that a recent (Karhunen-Loeve) decomposition of the alpha band of the resting alert human EEG revealed only three dominant temporal–spatial modes: anterior-posterior, rotational and standing (Friedrich et al, 1991) and "few frequency coherence" is a frontier of inquiry in brain wave research.

A heterogeneous collection of coupled nonlinear elements in the form of widely distributed, multi-location, multifrequency systems such as cross-cortical, brain stem-thalamic-cortical and interconnected spinal motor neurons can generate coherent activity. This temporal and phase coherence plays an important role in current theory of sensory-associative-motor integrative function, how distributed attributions come together in the brain representation of a single object or process, in the context of the so-called “binding problem” (Singer, 1993; Bressler, 1995; Nicolelis, 1995; Schiff et al, 1997). Diffusely distributed neurochemical variables have been invoked. For example, the role of metabotropic glutamate receptors in driving the synchronization of interneuronal networks has been suggested as a mechanistic model (Whittington et al, 1995). The objects of relevance to the discovery of Fermi-Pasta-Ulam are studied as the nonlinear physics of nondissapative wave processes and are called solitons (Zabusky and Kruskal, 1965). They have been invoked to model nerve conduction and information transport in brain (Scott, 1990).

A third counter-intuitive set of accidental computational findings is in an area of research called symbolic dynamics which involves the universal parameter-dependent coding language and capacity of nonlinear systems. In the early 1960’s, a group around Stan Ulam at Los Alamos (Cooper, 1987) used one of the early “high powered” computers, MANIAC II, to iterate (letting the output of the action of a discrete time function serve as its input the next time around) simple equations they called “maps.” These reduced dimensional objects shaped like tents, sine functions and parabolas can be extracted from and represent the behavior of higher dimensional, nonlinear differential equations (see Devaney, 1989; Schuster, 1989 or Moon, 1992 for intuitive descriptions). They varied a parameter, such as the height of the tent or parabola, to systematically change the period and/or phase (order) of the symbol sequence (Metropolis et al, 1973). Normalizing the range of values of the output to [0,1] and transforming the series of values into a binary code, $L \leq 0.5$ and $R > 0.5$, they found an invariant, one parameter dependent, progression of ordered periods, R, RLR, RLRR…RLLRL…, in all such single maximum maps. This “U (universal)sequence” has also been found as singly or multiply present in a variety of real systems, including complicated chemical reactions (Simoyi et al, 1982; Coffman et al, 1986). This means one can “dial” the parameter to generate “words” of sufficient computational complexity to serve as a language. These computer experimental findings had already been anticipated in a remarkable mathematical proof by Sharkovskii (1964).

The dynamical richness of these simple, single maximum, one dimensional maps was computationally explored in the context of ecological and epidemiological issues in the classical studies of Robert May (1976). It has been possible to relate the individually characteristic L, R sequence behavior of human subjects on a computer task to a unique parameter of a tent map generating those sequences which predicted age and discriminated subclinical obsessive compulsive from borderline syndromes (Selz and Mandell, 1993). The dynamical entropy of unstructured L,R behavior also discriminated a population of schizophrenic patients from normals (Paulus et al, 1996). More generally, parameter dependent dynamical coding, built into the universal behavior of its constitutive equations, is a mechanism with which a nonlinear dynamical system, such as nerve membrane equations as above, or in the aggregate, the middle layer of a completely connected neural network, can encode, Morse code-like, messages (Paulus et al, 1989).

Bifurcations in Biologically Relevant Dynamical Systems

Bifurcations, "splitting into (two) branches," are observed over a smooth change in control parameter(s) (independent variables), as a discontinuous and qualitative change in the dynamical (time-dependent) pattern of the observable (Guckenheimer and Holmes, 1993; Wiggens, 1990; see Strogatz, 1994, for a particularly intuitive description). Qualitative here means how the dynamics of the trajectory appear as a geometric-topological (relative shaped not necessarily sized) pattern in phase space. In such a space, the orbital points are located along the x-axis by their value, x at time *t*, and along the y-axis by their time rate of change at that *t*, $\frac{dx}{dt}$. To visualize a representative phase portrait in the plane, start by imagining the pattern made by mass hanging on a linear spring at rest as represented by a point centered at $x = 0, y = \frac{dx}{dt} = 0$. When perturbed from rest, the phase portrait of the motion of this "harmonic oscillator," is composed of a (continuous) series of points representing its location, graphed along x, its rate of motion graphed along , $y = \frac{dx}{dt}$. x and $\frac{dx}{dt}$ co-localize the circular orbit as it speeds up and slows down while it bobs up and down. The transition from a fixed point (the mass at rest) to a circle (the bobbing mass), a bifurcation in phase space, results in the loss of topological equivalence. That is, the phase space geometries before and after the bifurcation cannot be smoothly distorted into each other. Continuity and connectedness of the space is lost. For topological equivalence, stretching, bending and warping are allowed but not tearing apart and/or gluing together. Following the bifurcation of a fixed point into a circle, even limitless shrinking of the ring leaves a hole. The appearance or disappearance of an equilibrium fixed point (called a "saddle-node" bifurcation), splitting into two ("period doubling" bifurcation), its exploding into a circle ("Hopf" bifurcation to a limit cycle), a circle splitting into two or more incommensurate cycles ("secondary Hopf" bifurcation) and these multiperiodic ("quasiperiodic") dynamics breaking down into a recursive spirals ("homoclinic bifurcation to chaos") are among the common bifurcations in nonlinear dynamical systems, and all of them have been observed in many neurobiological settings.

In the forced-dissipative (energetically driven and energy consuming) dynamical systems relevant to the neurosciences---this characteristic contrasts with the dissipation free momentum of the classical mechanics of astrophysical bodies---there are four "most generic" bifurcation scenarios as a parameter changes that may, but need not, lead to chaos (see below for definition) (for early and physically oriented treatments see Eckmann, 1981; Ott, 1981; Berge′ et al, 1984, Kaneko, 1983). These scenarios are: (1) Fixed point or cycle splittings into twice-as-long period lengths 1→2→4→8→16...called the subharmonic or "period doubling route"; (2) The transformation of fixed points to one and then more periodic orbits, multiple independent (nonharmonic, incommensurate) frequency oscillations, their mode lockings and then breakdown called the "quasiperiodic route"; (3) Fixed point or cyclic equilibria metamorphosed into irregular bursting patterns called the "intermittency route"; and (4) In the context of quasiperiodic dynamics, adjacent nonharmonic frequency encoding parameter spaces fusing, resulting in new periods that are the sums of their adjacent ones: period 2 + period 3 = period 5, in what is called the "period adding route". Technically precise classification of bifurcations involve much more careful definitions and well studied technical constraints involving such issues as the symmetries and dimensionality of the system of observables, how many control parameters ("codimensions") are required to reasonably realize the bifurcation and the particular way the fixed points of the system become unstable, all of which are directly explorable when the equations are known or can be hypothetically inferred from the qualitative behavior of real data.

We note a few examples from the wide variety of bifurcating systems that can be found in the biomedical literature of interest for the biological sciences. With substrate input rate as the bifurcation parameter, the phosphofructokinase regulated glycolytic cycle in yeast extract was found to change among steady state, periodic and period doubling (subharmonic) regimes (Boiteux et al, 1975). Transitions between steady state, oscillatory and chaotic patterns have been reported in variety of physiological measures in man including respiratory rhythms and circulating blood cell concentrations over time (Mackey and Glass, 1977; Glass and Mackey, 1988) and models of dopamine cell dynamics (King et al, 1984). Flow rate parameter sensitive periodic, bursting and chaotic behavior has been found in a peroxidase-oxidase system (Olsen and Degn, 1977). A brain enzyme, substantia nigral dopaminergic tyrosine hydroxylase, manifested different saturation and fluctuation patterns, including bursting and periodicity, in experiments in which low (physiological) levels of tetrahydrobiopterin cofactor were the bifurcation parameters and adrenergic drugs were used as modulators (Mandell and Russo, 1981).

All four of the generic bifurcation routes to chaos, period doubling, changing multifrequency (quasiperiodicity), period adding and bursting (called "intermittency") were observed in self-sustained oscillations induced in the neural membranes of space clamped, giant squid axons that were immersed in a 550mM NaCl, and electrically stimulated over changing amplitudes and frequencies (Aihara et al, 1986; Takahashi et al, 1990). With external stimulus current level as the control parameter, the R15 cell of the abdominal ganglion of the Aplysia demonstrates transitions between bursting and periodic modes as well as period doubling, a signatory period 3 and the Lyapounov characteristic exponent evidence (see below) for the discontinuous onset of chaos (Canavier et al, 1990). Manipulating feed back delay, the human pupillary light reflex will bifurcate into regular oscillations (Milton and Longtin, 1990). A transition between a regime of irregular discharging to oscillatory bursting behavior was induced in basal forebrain cholinergic neurons by neurotensin (Alonso et al, 1994). Sympathetic nerve discharge in decerebrate, ventilated cats demonstrated transitions between periodic, multiple periodic (quasiperiodic with changing ratios to the ventilation frequency) and subharmonic behavior in response to inferior vena cava occlusion, vagotomy, aortic constriction and spinalization (Porta et al, 1996). Period adding bifurcations were induced by changing calcium concentrations or the addition of a potassium channel blocker in the “pacemaker” formed when (rat) sciatic nerve is chronically injured (Ren et al, 1997). Changing levels of the L-type calcium channel antagonist, verapramil, alter the pattern of vasomotion of rabbit ear arteries among sets of multiple independent periods, “quasi-periodicity,” mode locking and chaos (De Brower, 1998). At critical intensity and frequency, flicker visual stimulation of the salamander generates a pharmacologically modifiable period doubling bifurcation in their ganglion cells (one spike for every two flickers) which is also seen subjectively and in occipital lobe evoked potentials at critical frequencies in bright, full-field flickered humans (Crevier and Meister, 1998).

Qualitative and Quantitative Universality in Nonlinear Dynamical Systems

“Universality” (see above) entered the parlance of physics in the context of the statistical mechanics of phase transitions near their critical points (Stanley, 1971; Stauffer, 1985; Yeomans, 1993) and has come to refer to the finite set of transitions and quantities common to nonlinear systems arising in their neighborhoods. A common physical example is the triple point of water-ice-steam on the temperature-pressure phase plane where a small change in temperature or pressure leads to a global qualitative change in physical state. Analogously, the loss of topological equivalence occurs at the fixed point that, for examples, splits into two or explodes into a cyclic orbit in phase space. The same critical point behaviors and quantities occur in a wide variety of specific processes and their equations, and they are independent of the way the trajectories first arrived in the fixed point neighborhood. Once the system enters the regime of critical behavior, the predictive significance of its dynamical history is lost. This may also be the case for emergent psychiatric disorder (Mandell et al, 1985; Mandell and Selz, 1992; Ehlers, 1995; Paulus et al, 1996; Huber et al, 1999).

There are diagnostic patterns of behavior when a nonlinear system is in a neighborhood of a potential bifurcation. They include sudden and/or large jumps resulting from a small change in experimental conditions, the appearance of big baseline fluctuations (anomalously large variance), the lengthening of the time required to relax following evoked or spontaneous perturbation ('"critical slowing"), the same global change in state occurring at different values of the parameter when increasing versus decreasing a parameter's value ("hysteresis"), the existence of some range of values of the observable that cannot be attained by manipulation of the parameter ("inaccessibility") and the availability of two or more distinct states in the same parameter neighborhood ("modality") (Thom, 1972; Arnold, 1984; Gilmore, 1981). It is perhaps relevant to polydrug psychopharmacology and clinical management that the higher the co-dimension (the greater number of effective parameters being manipulated), the greater the accessibility and control of selected state stability becomes with respect to difficult to obtain behaviors. Examples of the potential advantages of simultaneous manipulation of multiple influences have been developed for affect disorder and anorexia nervosa (Callahan and Sashin, 1987).

As evidence for the independence of critical behavior from specific history, the qualitatively universal bifurcations along the four canonical routes to chaos manifest dimensionless ratios of parameter and phase space geometries between bifurcations. These ratios are quantitatively universal. The formalisms that rescale the distances from fixed points in parameter and observable spaces result in the same picture across scale, a dilatational symmetry (also called self similarity or affinity). They are called renormalization group equations, and, with respect to prediction, they replace any or all of the original specific predictive equations for the particular system under study (Cvitanovic′, 1989). Whereas the U sequence and critical point behaviors are manifestations of qualitative universality, these scaling numbers are manifestations of quantitative universality. We discuss them here because their omnipresence in computationally realized differential equations as well as physical and chemical experiments along with their quantitative specificity (with values in all systems as "constant" as π) constitute a most persuasive argument for the substantiality of modern dynamical systems approaches to brain and other biological research.

The physical and physiological requirements for manifestations of these universal bifurcation scenarios can appear to be remarkably minimal. In physics, for example a full panoply can be observed in a "dripping faucet" (Shaw,1984). Similarly, a small piece of extirpated and perfused myenteric or femoral artery will demonstrate these transitions in vasomotion spontaneously and almost independent of flow rate (Stergiopulos et al, 1998).

Feigenbaum discovered that in dynamical systems manifesting a series of period doubling bifurcations, the ratio of the parameter value at which the next period doubling bifurcation occurred relative to the last one $\approx \frac{1}{4.6692}$… and the ratio of the magnitude of the spawning point to the one spawned $\approx$ 2.5. (Feigenbaum, 1979). By "rescaling" distances along a parameter value (see below) using what is called a "universal renormalization operator" the geometric situation around each bifurcation point (though of different absolute "size) remains relatively the same. In intermittent systems, burst length varies as the inverse square root of the distance of the value of the parameter from that value that elicited the fixed point (Manneville and Pomeau, 1980). The universal characteristic of the third common parametric route to chaos, quasiperiodicity, is that the ratio of independent frequencies found most resistant to mode locking and breakdown into chaos is, $\frac{\omega_i}{\omega_{i+1}}$ = 1.618… the number to which the ratio of adjacent Fibonocci numbers converge (1, 2, 3, 5, 8, 13, 21…) (Shenker and Kadanoff, 1982). Similar quantitative scaling properties were also discovered in the parametric period adding route (Kaneko, 1983).

All of these scaling numbers have been found in experiments and in remarkable agreement with theory. Examples have been discovered in electronic circuits, hydrodynamic and mercury flows, acoustic systems, laser dynamics and oscillating chemical reactions (see Cvitanovic′, 1989, for representative list of references). Whereas qualitative evidence for all of these bifurcation scenarios have been found in brain relevant experiments, there is yet to be a bifurcating experimental biological system with adequate precision across a sufficient range of magnitudes such that quantitative universality could be demonstrated across a sufficient range of values to be convincing. We remind ourselves that in order to establish a Fiegenbaum number, each period doubling bifurcation of the several required necessitates about a five-fold improvement in the experimenter's ability to specify the control parameter.

Using Invariant Measures of Dynamical Neurobiological Systems

Before the modern era of dissipatively forced (energy utilizing) dynamical systems research, the known attactors of an experiment's initial values resulted from their convergence onto either a fixed point or a limit cycle. An attractor can be regarded as a set which remains in bounded space and to which all orbits in this neighborhood converge (Milnor, 1985). Since by the rules of differential equations, orbits are required to be both smooth (graphable without lifting the pencil) and unique (different trajectories don't intersect since the point of intersection would no longer be unique), the foundational Poincare-Bendixon theorem says that any such orbit confined to a two dimensional phase space that doesn't converge to a fixed point must, no matter how long it irregularly wanders, must, eventually intersect with itself and then go around the same route again in a (perhaps very long) cycle. In most neuroscience research as well, we have generally regarded our data as manifesting either tolerable (or intolerable) fluctuations around mean values (fixed points) or more or less regular cycles. We analyze our “fixed point” data using quantities such as the mean and variance of distributional statistics and the cycle data using the amplitude, frequency, cycle length and phase of trigonometric functions. In central tendency-oriented research, rare, very high amplitude events have usually been considered aberrations and tossed, and imperfect periodic behavior is treated by “cosiner analysis” as regular cycles contaminated by measurement or system noise. Whereas technically, chaotic dynamics must live in dimension greater than two (for orbits to be more than a fixed point or limit cycle, able to snake around without necessarily intersecting), the Lorenz attractor has dimension just a little over two, our difficulties with establishing the “true” physiological dimension of real biological observables (see below) makes such a consideration more theoretical than practical.

The orbits of a forced-dissipative dynamical system in a parameter regime engendering chaos, converge onto an attractor which is neither a fixed point nor a limit cycle, thus the origin of the name “strange attractor” (Ruelle and Takens, 1971). It was James Yorke that first named these dynamics “chaos” (Li and Yorke, 1975). The necessarily statistical properties of the chaotic orbits on strange attractors follow from the generic characteristics of their motions (see Shaw, 1981 for a still conceptually current, non-mathematical treatment). These kinds of statistics are studied in a research context called the “ergodic theory of dynamical systems” (Ruelle, 1979; Eckmann and Ruelle, 1985). Ergodic is a word used to characterize a system with (or without) a particular condition placed on its statistical measures: the existence of an invariant measure which is undecomposabile into two invariant measures and, equivalently (though not obviously) one in which the time average equals its average in the geometric space into which it is embedded. One may arrive at the same ergodic measure from studying a single very long orbit or from summing across many individual but shorter orbits. This ergodic equivalence is made possible due to the definitional existence of at least one invariant statistical measure and the dynamics of the system which ideally include a uniformly, sequence disordering process called “mixing” (see below).

Of course, most real biological dynamics are not uniformly mixing and so are non-ergodic, but we shall see that the ways they fail to be ergodic (and thus remain in the conceptual context of ergodic measures) are descriptively useful (Mandell and Selz, 1997a). The emergence of many statistical approaches to characterizing these motions have been accompanied by the expected controversies about which is best or correct (see below) and have been applied to the problem of diagnosis and clinical discrimination in a variety of neuroscience settings. In ideal abstract chaotic dynamical systems called Axiom A (Russians called them "C systems"), where most mathematical theorems are proven (Smale, 1967), all these measures, if properly computed, are equivalent. In real life, as in the related case of ergodicity, they are not, and since no single one is complete, the more (incomplete) measures we use in our studies along with interest in the way that they differ, supplies more useful information about the system. Though researching and elucidating the most reliable and valid ways of computing these measures are a valuable goal, the current debates focused on the superiority of a single particular measure, constructed in a particular way in relationship to issues of insoluble absolutes like "randomness" versus "deterministic chaos may not be particularly valuable for uncovering new characteristics and potential mechanisms underlying a specific set of real neurobiological observables.

Emphasizing diversity and relevance to the clinical biological sciences, we note that quantifying patterns in ergodic (non-ergodic) measures have aided: the discrimination between normal and abnormal opticokinetic nystagmus in neurology patients (Aeson et al, 1997); localizing a two year old subcortical stroke in an EEG of a patient with no other signs or neurological findings (Molnar et al, 1997); the diagnosis of early (not late) multiple sclerosis, as a nonspecific long tract disorder, in patients with mild optical neuritis using cardiac rate dynamics (Ganz and Faustman, 1996); seizure prediction from minutes to hours before the event in which subthreshold, pre-phase transition spatial diffusion and oscillations in characteristic changes in these measures can be found (Martinerie et al, 1998; Elger and Lehnertz, 1998; Pign et al, 1997; Iasemidis et al, 1990); using these measures on the EEG to differentially predict hereditary predisposition to alcoholism

(Ehlers et al, 1995); indicating the presence or absence of septic encephalopathy (Straver et al, 1998); using time series from jejunal manometry to discriminate objectifiable somatic from psychological conversion related irritable bowel syndrome (Wackerbauer et al, 1998); analyzing time-dependent patterns in plasma hormone levels to discriminate between the presence or absence of a functioning tumor (Hartman et al, 1994, Mandell and Selz, 1997a); automated differentiation of ataxic from normal speech (Accardo and Menulo, 1998); and discrimination of temporomandibular joint dysfunction from normal patterns of chewing motions (Morinushi et al, 1998).

Styles of Orbital Motions in Chaotic Dynamical Systems

In chaotic dynamics, in various specific ways, an initial hypothetical handful of points lined up along the trajectory and acted on over time by the nonlinear differential equation ("operator"), get out of order in an unpredictable way. Here the hypothetical handful can come from a statistical aggregate of initial conditions or from a single recursive orbit studied over long times. As noted above, ergodic theorists call this getting out of order "mixing" and how and to what degree this happens consumes many mathematical theorems but for purposes of brain research, it can be best described using a variety of statistical measures. For example, visualizing the Lorenz attractor (see above) as a butterfly in phase space, the points get out of order because as they spiral out ("stretching") to the edge of one wing and return ("folding") to the unstable fixed point on the butterfly's body whence they either jump to some place on the other wing to spiral to its edge or return to the same wing to spiral out again. Which one of these is chosen is exquisitely sensitive to very small changes in where the trajectory started and very small fluctuations in where it returned to the unstable fixed point on the butterfly's body. In fact, specification of these locations is beyond the precision of any real, thermodynamically vulnerable system.

Chaotic trajectories on the Rössler attractor (see above) wind out ("stretch") to the edge along the inside of a conch shell in phase space and then are mapped back ("fold") into the spiral unpredictably somewhere in a mixing mechanism that has been called "displaced reinjection." In the slow-fast oscillations of the forced van der Pol in the chaotic regime, points in the slow phase ("repolarization") jitter around and step on each other's heels, getting out of order while waiting on the ledge before jumping ("depolarization") to the next slow phase ("repolarization") at some unpredictable time, thus generating a variably irregular series of interspike intervals.

Stretching and folding are also responsible for getting points get out of order in the single maximum map of the unit interval (studied for universal qualitative and quantitative properties by May and Feigenbaum and others as described above). With increases in parameter values, the parabolic hill function onto which the unit line has been stretched gets steeper, more stretched. Mapping points on the hill back onto the straight line of the unit interval results in what amounts to the line folding back on itself. This stretching and folding eventually fills the line with points, but their sequence, from end to end, gets shuffled like a deck of cards.

As described more generally above, points that start as neighbors may get separated ("divergence along the attractor") and those that start at a distance from each other may be thrown together ("compression back onto the attractor"). These expanding and folding motions that characterize the chaotic behavior on strange attractors have been likened to the actions of a taffy puller (Rössler, 1976). It is in this way that nearby points can separate without leaving the attractor. It is also the case that once indistinguishably close but then separated points may be compressed together again generating new, temporary (unstable) cycles of all possible period lengths. These unstable fixed points may be the most important feature of chaotic systems from the standpoint of new ideas about brain mechanisms (Pei and Moss, 1996; So et al, 1997). This aggregation of unstable loops can occur from points fluctuating away and back to the attractor as well as during the crowding of points at the turns after their stretching out on more linear parts of the flow. Under the mixing flow of a chaotic dynamics, it is also true that a single point eventually explores the entire attractor, no attractor location is inaccessible to it.

Although counter-intuitive when expressed in words, the trajectories that one sees in the graphics of chaotic attractors result from the actions along the "unstable" directions of the stretching distortion; the actions in the otherwise invisible stable directions "iron down" the points onto this unstable manifold (n dimensional abstract surface).

As might be expected from this set of characteristic motions, the diagnostic triad of chaotic dynamical systems are: (1) Sensitivity to initial conditions—tiny distances between starting points are magnified and large distances between starting points are reduced under the stretching and folding actions of the system; (2) The presence of a theoretically infinite but countable number of unstable periodic orbits of theoretically all period lengths—points in phase space can be viewed an attractive-repellers, visited and left by the orbits recursively as the dynamics proceed; and (3) Indecomposability—the attractor is not separable into isolated regions and no points escape (see Devaney, 1989, for one of the clearest definitions). Of particular relevance to information encoding and transport by brain mechanisms, it is important to visualize that new information in the form of unstable periodic orbits is being created as well as destroyed by the dynamics. The logarithmic rate of formation of these new orbits is computed as the system's topological entropy (see below).

Assuming the real neurobiological system under study is behaving in these ways (and often much has to be done to help justify such a claim), the observables take the form of an irregular and/or episodic time series of amplitudes, as in repeated sample, neuroendocrine studies of plasma hormone levels (Veldhuis and Johnson, 1992) or a sequence of times between events as in neuronal interspike intervals (Katz, 1966; Perkel et al, 1967). These time or time-sequence series are generally studied from three relatively distinct yet complementary quantitative perspectives: (1) As stochastic ("random") processes with various amounts of sequential dependency (autocorrelations) and scale (sample length) dependencies; (2) As "deterministic" smooth or discrete, vectorial geometries in phase space following reconstruction and/or embedding of the series as phase portraits or return maps; (3) As information generating and transporting, topological (about relative nearness and sequential order not absolute distances), symbolic dynamical processes which as either (1) or (2) can be analyzed with respect to its various entropies, algorithmic complexities and word content and syntax. A variety of techniques aimed at deciding between the relevance of one or another of these underlying assumptions (such as series and Fourier phase shuffling to destroy statistical autocorrelations and vectorial continuities but leaving the probability density distributions intact) may at times help emphasize one or another of these orientations in the analyses (see Ott et al, 1994 for a collection of articles on this topic).

Nonconvergent Distributions and Power Law Scaling in Biologically Relevant Time Series

The statistical distribution with which most of us are familiar is the Gaussian which can be generated by summing and averaging a series of independent random events. The average behavior head/tails probabilities observed by one person flipping a fair coin for a very long time or by many people flipping similar coins for shorter times converges upon the invariant measure of 0.5. The variance, "second moment" in the distribution of a population of coin flipping sequences will be finite and computable. In a graph of this distribution, the tails will converge to the x axis in a Gaussian exponential manner. The longer or the more numerous the "sample" series of observations, the closer they will approximate the "ergodic" invariant measures representing the true "central moments" of the behavior of this "population" of fair flipping coins. Since the coins are not changing their relevant characteristics over the time of observation, we say that the series is not time dependent but instead is "stationary." Computation of correlations over increasing lags to determine how much and for how many flips the sequences continue to resemble themselves yield an exponential decay with a single characteristic correlation length. This reflects the existence of a finite variance from which its amplitude is derived and serves as the single characteristic temporal scale of the random process.

Before describing the relatively new set of measures of biological processes designed to find and quantitate what are assumed to be relatively sample size insensitive, distributionally nonconvergent and multiply correlated processes that are without a single time or space scale, we should remind ourselves that there is already much more apparent "order" in a generically random situation than our intuitions would lead us to believe. For example, if we keep cumulative scores in a competition between heads and tails and determine the distribution of trials between those in which the number of heads and tails are even, we will get periods between zero crossings of many lengths with very short ones and very (very) long ones being most statistically prominent. The distribution of these wavelengths is shaped like a symmetrically fat-tailed, bowl (Feller, 1968). As another illustration, expected runs of heads or tails in this Gaussian random task are longer and more frequent than we might suspect. It has been proven that the expected run length grows with *n* coin flips (as an order of magnitude estimate) like the logarithm (for a fair coin, base 1/p = 1/0.5 = 2) of *n.* For example, in 512 (e.g. 2^9) tosses, we cannot report a run of 9 heads as a evidence for a biased coin or the sign of some deterministic coin tossing mechanism (Erdos and Renyi, 1970). If we had a 0.6 head biased coin, then the observation of a run of 13 heads couldn't dissuade us from a random mechanism!

Unlike our random coin task, the variances of many, perhaps most, time series of biologically-relevant events, do not tend to converge onto a limiting value as sample size, *n*, grows, but rather continue to increase (or decrease) with *n* in a scale invariant manner. Instead of "regressing to the mean" with increasing sample length or number, the likelihood of a larger deviation than previously observed increases with *n.* Analyses of inter-event intervals reveals a multiplicity of characteristic times. One interpretation of these finding might be that this represents evidence for the inherent "nonstationarity" of biological mechanisms as reflected in, for examples, the frequency of saccades concomitant with ceaselessly shifting foci of visual attention (Steriade and McCarley, 1990), or our inability to not think of "white bear" when so instructed (Wegner, 1994). Hermann Haken, the father of laser-inspired "synergetics," has said that biological mechanisms are not in a steady state for very long, spontaneously and irregularly jumping from one unstable dynamical state to another (1997). This suggests that meaningful tension between experimental sample lengths long enough to minimize statistical error and short enough to be stationary may be, for the biological sciences, more apparent than relevant.

The studies reviewed below exploit measures arising from the view that the noisy statistics of nonstationarity in biological processes are not a sign of measurement error, but rather evidence consonant with the statistical physics of nonequilibrium states and phase transitions (Stanley, 1971; Stauffer, 1985; Yeomans, 1993). Very high amplitude fluctuations and multiple, up to infinite, correlation lengths are characteristic of the normal, on-going biological dynamical behaviors, which are apparently without characteristic amplitude and time scales. From this point of view, if most or all information is widely distributed in the brain (e.g., serial order of visual tasks involving motor cortical neurons, Carpenter et al, 1999)) then the "binding problem" (see above) could also be solved by multiple, up to infinite spatial and temporal correlation lengths in place of the current theories of monofrequency resonances (Singer, 1993). Hierarchical neurodynamical mechanisms communicating across many mechanistic temporal and spatial scales, brain information transport analogous to the energy cascade of hydrodynamic turbulent velocities (Tennekes and Lumley, 1972), would be likely in the parametric vicinity of incipient bifurcations and phase transitions.

Three closely related techniques for quantifying the systematic changes in average fluctuation amplitudes with *n* (scale, sample length) involve a "power law," linear slope relationship between the logarithm of an index of variability and the logarithm of sample segment sizes. These easy, yet powerful methods were brought to experimentalists' attention by Benoit Mandelbrot (Montroll and Badger, 1974; Mandelbrot, 1983; Fedor, 1988; Bassingthwaighte et al, 1994; Liebovitch, 1998). To estimate the exponent in Hurst rescaled range analysis, we compute the standard deviation and the range of the deviation of the running sum from the mean on sequential subsamples of increasing size. The Hurst power law exponent is the slope of the straight line formed by graphing the logarithm of the subsample length along the x axis and the logarithm of the ratio of the range to the standard deviation on the y axis. An independent random system has a Hurst of 0.5. If a sequential increase or decrease in an amplitude or inter-event time tends to be followed by a change in the same direction, the Hurst > 0.5. If an increase in the measure tends to be followed by a decrease, then Hurst < 0.5. Computation of the Fano factor (power law exponent) exploits the same general strategy using the variance/mean in place of the range/variance and counting the number of events (such as single neuron discharges or heartbeats) in time windows of increasing length, generating a similar log-log graph. There is a relatively long history of the use of spike-number variance-to mean ratio in studies of response variability in visual cortical neurons (see Teich et al, 1996 for a review). The Allen factor (power law exponent) tends to reduce the influence of local trends by a computation of the variance of the difference between the number of events in two successive time windows divided by twice the mean number of events in the window.

Each system's invariant logarithmic slope across sample segment sizes takes the place of its missing finite variance in characterizing experimental data in which the distributional tails do not converge (or do so very slowly) to the x axis. Recent approaches to these measures in the context of stochastic analysis of DNA sequences, but also applied to normal and pathological cardiac inter-beat intervals and gait interval sequences, have dealt with the influence of non-stationarity due to apparent trends in the data on α-equivalent indices by local mean-normalization of the fluctuations at each window size (Peng et al, 1993; Peng et al, 1995; Hausdorff et al, 1995).

The rate of decay of the densities in the tails of the probability distribution as they approach extreme values along the x axis, called the Levy exponent when represented in Fourier space (technically, as a "characteristic function" of the probability distribution) (Shlesinger, 1988; Shlesinger et al, 1995), can also be computed directly on the distribution by fitting the tails with a two parameter curve quantifying their "fatness" and rates of decay (Mantegna, 1991). We can speak of a Gaussian tail as having an exponential decay rate representable by $\alpha = 2$ implying finite variance. A tail with a nonconvergent decay rate of $1 < \alpha < 2$ indicates non-finite variance in the data such that the usual "normal curve" derived, standard deviation dependent tests of statistical significance are without meaning. $\alpha < 1$ indicates the data is without a consequential mean and will require the use of interquartile measures to locate the center of the distribution (Adler et al, 1998). Recalling that the Hurst, Fano and Allan indices are invariant across sample segment size, we remind ourselves that, as is the case in the finite mean and variance, $\alpha = 2$, Gaussian, any of the other "α tails" also retain their value ("shape") across all partitions that might be used to sort and sum the observable. This property is called convolutional, α, stability. In passing it should be noted that the last outpost of convergence of a probability density distribution with $\alpha = 2$ is called "log-normal," in which the tails along the x axis are "pulled in" by the variable being plotted as its logarithm.

A Hurst exponent of > 0.5 in the data is associated with a Levy exponent of < 2.0, and both would be indicative of a process in which the characteristic style of change, rather than decay with some finite correlation length, would persist across all time. Using a bursting neuron as a generic example, a short interspike interval would, on the average, be followed by another short one and a long one by another long one, and this behavior, unlike our fair coin flipping sequence of observables, would not become uncorrelated with itself even over infinite time. Another way to represent this infinite, innumerably lengthed, correlation property is via its implicate frequency (inverse wavelength) content by computing its best fit assortment (along with their densities) of a range of short to long sine waves forming the Fourier transformation of the correlation function. The condition of correlated fluctuations across many measured temporal scales yields yet another power law slope when graphed as the logarithm of its range of frequencies, f, plotted along the x axis, versus their corresponding amplitudes squared, powers, plotted along the y axis. Naming this spectral power law exponent β, the system's characteristic scaling law is usually expressed as $\frac{1}{f^{\beta}}$(Fedor, 1988; Hughes, 1995; Shlesinger, 1996;

Liebovitch, 1998).

We see that the Hurst exponent, Fano and Allen factors, Levy exponent and power spectral scaling exponent are kindred statistical descriptors. They are most usefully applicable to systems with distributions that fail to be Gaussian or asymmetrically Poisson, the latter from random data sequences with only positive x values, thus backed up toward zero by a minimum inter-event interval or amplitude. These time series are sequentially dependent, not conventionally stationary, without finite central moments and with self-correlations that don't demonstrate Gaussian exponential decay with sample length or time. The following are some examples of the use of these measures in studies of biological dynamics. .

Examples of Biological Data with Divergent Distributions and Power Law Scaling

A paradigm challenging group of experiments involved models and measures of the distribution of characteristic open and closed times of membrane ion conductance channels. The usual approach to this problem assumed the existence of a small set of distinguishable channel types that were reflected in discrete conductance events with a small set of characteristic open and closed times. The distributions of each of could be fitted with its own, Markov process derived, exponential. With technical advances and improved temporal resolution, more characteristic times and their associated $\alpha = 2$ exponentials were reported with as many as three not being unusual. Liebovitch (and Sullivan,1987; 1989) used analogue to digital transformation of current recordings from the unselective corneal epithelial channels and voltage dependent potassium channels in cultured mouse hippocampal cells at temporal resolutions ranging from 170 to 5000 Hz and found similarly shaped, $\alpha < 2$, nonconvergent distributions across temporal scales. This led these investigators to suggest that, related to the >16 recorded magnitudes of characteristic times, from picoseconds to months, in autonomous protein motion (Careri et al, 1975; Gurd and Rothgeb, 1979), that there was an "α stable" hierarchy of lifetimes of states, observable at almost any temporal resolution that methods would allow.

Early and representative studies comparing the fit of the data with hierarchical scaling functions versus a sum of a small number of Markovian exponentials included studies of a calcium activated potassium channel in human fibroblasts (Stockbridge and French, 1989) which yielded evidence to support both models, as did studies of membrane conductances in corneal epithelial cells by another group (Korn and Horn, 1988). In a systematic comparison of scaling and Markov exponential modes of the gating kinetics of GABA activated chloride channels, acetylcholine activated end plate potentials, calcium activated potassium channels and fast chloride channels (McManus et al, 1988), it was found that the latter fit the data best in most experiments. Similar results were reported in studies of the glutamate and delayed rectifier potassium channel with respect to distributions of open and closed times (Sansom et al, 1989). Space does not permit a systematic account of the continuing debate and conflicting studies about these representations and the implicit biophysics of discrete, finite versus continuous, hierarchical channel event heterogeneity. It is interesting that recent experiments making use of Hurst rescaled range analyses of time series of whole cell membrane voltage fluctuations (without the assumptions and current renormalizing procedures associated with patch clamping) have yielded additional evidence for multiply correlated, Hurst > 0.5, $\alpha < 2$ power law behavior of what some might regard more generally as a protein relaxation time mediated hierarchical array of ion conductance behaviors (Liebovitch and Todorov, 1996).

Following the discovery of (very) subsaturating (“far from equilibrium”) rat brain levels of the common cofactor for tyrosine and tryptophan hydroxylases, tetrahydrobiopterin (Bullard et al, 1978), studies of amino acid substrate saturation functions and time courses determined at these low, physiological co-reactant concentrations manifested patterns of hierarchical multiplicity and discontinuities suggestive of bifurcations and time-dependent fluctuations with fractional (hierarchical) time scaling exponents that were sensitive to psychotropic drugs

(Mandell and Russo, 1981; Knapp and Mandell, 1983; Russo and Mandell, 1984a; Russo and Mandell, 1986). Similar bifurcating and power law kinetics were found in receptor-ligand binding systems (Mandell, 1984) which were confirmed by more recent studies of diffusion-limited binding kinetics with receptors immobilized on a biosensor surface (Sadana, 1998). Hierarchical kinetics have also been reported in time courses of drug and metabolite levels (Koch and Zajcek, 1991), tissue tracer washout studies (Beard and Bassingthwaighte, 1998), carrier mediated transport processes (Ogihara et al, 1998), general pharmacokinetic functions (Macheras et al, 1996) and biochemical networks (Yates, 1992). It is likely that bifurcating and hierarchical, power law kinetic functions will be studied more commonly in the chemical literature in general (Shlesinger and Zaslavsky, 1996; Berlin et al, 1996) as well as applied to a variety of protein-mediated biological functions (Dewey, 1997).

The first demonstration of and stochastic model for nonconvergent distributions of interspike intervals of a single neuron was by Gerstein and Mandelbrot (1964). Though rich with possibilities, it has been only very recently that additional work from this point of view has been published. This is likely due to the fact that most neuroscience oriented statistical packages, with rare exceptions, are without techniques for computing descriptive parameters for these divergent probability density distributions. This has not been the case for economic time series, download STABLE from http://www.cas.american.edu/~jpnolan. Recently, applications of the Fano and Allan factor as well as power spectral scaling exponents to observed and shuffled series of spike counts and interspike intervals in the auditory and visual systems (including spatial and/or time resolved single unit recordings in retinal ganglion, lateral geniculate and lateral superior olivary cells as well a auditory nerve fibers) demonstrate the characteristic behavior of nonconvergent, hierarchical stochastic systems (Teich, 1989; Teich et al, 1990; Lowen and Teich, 1992; Kumar and Johnson, 1993; Kelly et al, 1996; Teich et al, 1997). These statistical techniques are well suited to the characterization of the irregularly intermittent bursting patterns generic for activity in single neurons as well as in nonlinear equations representing them and other brain processes (Mandell, 1983).

An early study of power spectral scaling in the EEG reported alpha band fluctuations that extended a $\frac{1}{f^{\beta}}$, $\beta \approx 1$ pattern to 0.02 Hz (Musha, 1981), as did other applications of the log-log power spectrum to the EEG in man (Hu and Hu, 1988; Prichard, 1992). This power law scaling led naturally to the suggestion that the range of frequencies available in the electromagnetic signal from the calivarial surface extends far beyond those currently appreciated and may be available for study using relatively noise free recording techniques such as the magnetoelectroencephalogram (Mandell and Selz, 1991). A not surprising range of intrinsic correlation lengths reflected in Hurst > 0.5 and/or Levy exponents < 2 have been reported in lamb fetal breathing patterns (Szeto et al, 1992). The exponent has been shown to be sensitive to maternal alcohol intake in humans (Akay and Mulder, 1998), rat neonatal motoric activity (Selz et al, 1995), and nuchal atonia duration sequences (associated with putative intra-uterine REM sleep) in fetal sheep (Anderson et al, 1998).

Sequential amplitudes in 1 Hz stimulated soleus spinal cord H-reflex demonstrated a $\frac{1}{f^{\beta}}$, $\beta \approx 0.83$ in control subjects and, reflecting the decrement in correlations, by 0.31 in patients with losses in supraspinal input from spinal cord injury (Nozaki et al, 1996). Whereas the sequences of fixation times in eye movements of normal control subjects reading difficult material demonstrated an exponentially decaying distribution, those of schizophrenic patients demonstrated a power law tail, consistent with more sequential correlations (Yokoyama et al, 1996). This finding may be related to the appearance of velocity arrests, runs of sticky fixed points, in a spatially oscillating target task, called "smooth pursuit eye movement dysfunction" in schizophrenic patients which has been modeled as a parametric disorder in a periodically driven nonlinear dynamical system (Huberman, 1987). The "short time fractal dimension" has been used to discriminate acoustic signal transformations from the speech of normal subjects and ataxic patients (Accardo and Mumolo, 1998). Spontaneous changes in the apparent syllabic sound made by regularly presented, word-like auditory stimuli emerge irregularly, the duration of perceived sameness demonstrating a power law distribution of "dwell" times (Tuller et al, 1998). The same kind of power law distribution of characteristic "brain times" can be found in studies of gait cycle durations in normal walking (Hausdorff et al, 1996) with a decrease in this locally detrended, α-like index compared with controls (0.91 ± 0.05) in patients with the basal ganglia disorders of Parkinson's (0.82 ± 0.06) and Huntington's (0.60 ± 0.04) Diseases (Hausdorff et al, 1998). Hurst > 0.5 has been speculated to more accurately quantitate the fundamental time structure of cells that was previously called circahoralian (ultradian) intracellular rhythms (Brodski, 1998).

Reconstructions of Time Series as Orbital Geometries

Rene Thom (1972), extending the ideas of Poincaré and D'Arcy Thompson (1942), argued that experimentally useful, intuitive connections between the qualities of biological processes and the quantities of an explicit (equations known) or implicit (equations unknown) dynamical system could be best achieved through the use of graphic representations of their geometric and topological forms. Notably successful examples can be found in the work of Thom, Arnold (1984) and Zeeman (1977), who were inspired by "caustics" (the shapes made on surfaces by the coincidence of reflected or refracted light rays) and Whitney's representation of parametric manifolds (surfaces) by the shadows they would make on a plane when back lit (Whitney, 1955). This led to a small number of qualitatively predictive, number-of-independent-parameters dependent shapes, such as "folds" "cusps" and "wavefronts." Experimentally crossing the values of these independent variable forms at their singular boundaries successfully predicted discontinuities in the otherwise smooth alterations in the dependent variable; i.e. bifurcations ("catastrophes") in the behavior of the observable. This approach was best suited to the study of systems with many independent variables and one dependent variable that could be mapped on the axis of the latter to represent a continuum of operationally defined “energy states.” Smooth changes along the path of the nonlinear parameter manifold generated discontinuous changes in energy levels indicating states of the observable. Crossing a wrinkle in an “independent variable” (some call it “order parameter” to indicate its emergence rather than availability for predictable manipulation) such as the nonlinear parameter surface of the countervailing influences of survival fear and financial cost, may lead to a bifurcation in behavior from peace (“low energy”) to war (“high energy”) (Zeeman, 1977).

In a similar geometric spirit but dealing with nonequilibrium systems in motion, the conditions such that one could “smoothly” embed a trajectory like a continuously recorded EEG record, a complicatedly coiled snake into a three or higher dimensional box without loss of its essential dynamical or statistically measureable properties, was settled by Whitney in what is now referred to as the “embedding theorem” (Whitney, 1936). Starting with a tangled knot of overlapping vectorial orbits with apparent “non-invertable points” (given a point, one cannot chose among or between the more than one point that it apparently came from), it can always be unwrapped into a non-crossing trajectory satisfying uniqueness when reconstructed in a box of a little more than twice the parameter-determined dimension of the original space of observables.

A common technique for the spatial reconstruction of the output of a dynamical system is called a “time delay embedding.” This approach, first suggested by Ruelle (1987, pg. 28) replaced the value, x, versus the time derivative, $\frac{dx}{dt}$, phase portrait plot described for a continuously perturbed bob on a spring above. A sequence of observables over time, in, for example, three dimensional “phase space” (Packard et al, 1980; Takens, 1981; Sauer et al, 1991), is depicted by a curve representing the system’s trajectory at times t_1, t_2, t_3, by sliding one-by-one down the series and plotting each p_1, p_2, p_3, location with respect to each other along the x, y and z axes respectively. The choice of time interval between the points, the delay, can be delicate and usually some standard fraction of the decay time of the sequence’s autocorrelation length, “the decay time of mutual information” is chosen. There are many technical considerations, including those involving the choice of the embedding space vis a vis the “true” dimension of the attractor. This becomes an issue when, for example, the attractor shrinks over time to some subspace of the initial embedding (Liebert et al, 1991 and references therein).

If we imagine the process of time series reconstruction to inscribe an attractor’s untidy ball-of-string of recurrent trajectories in three dimensions, we can then, by making the z-dimension a constant value, cut the ball with a two dimensional plane, a “Poincaré surface of section.” This could yield a roundish cloud of discrete points on the x,y plane and $t_{n-1} – t_n$ would be the time between two piercings of this surface. It has been proven that almost any cut, as long as it is made transverse to the direction of the orbital trajectories, is equally valid and useful for further analyses (Oseledec, 1968). If the original embedding and subsequence section was in high enough dimension to allow invertability, we might have enough (trial and error) knowledge to be able to write a discrete equation, a “return map,” f, that would move one point to the next on the plane as $(x,y)\,t_{n-1} \xleftrightarrow{f} (x,y)\,t_n$.

What can sometimes be case with real systems (Coffman et al, 1986), is that reducing the geometric reconstruction still one dimension further, accepting non-invertability, ironing down the points in the plane onto the x axis line (normalized to [0,1]), and plotting the values at x_t against x_{t+1} (“mapping the unit interval to itself”), can generate points in the general shape of a parabola with dynamics representable by the same family of one parameter, single maximum discrete equations that generated May's sequence of bifurcations, Feigenbaum’s scaling and Metropolis, Stein and Stein’s (and Sharkovskii’s) U sequence (see discussions of qualitative and quantitative universalities above).

Although sometimes a significant change in brain system physiology, such as penicillin-induced epileptic neuron spiking activity is revealed simply by a change in the graphic appearance of suitably embedded time series data (Zimmerman and Rapp, 1991), more often statistical measures made on the geometric dynamics of the points on the attractor are required.

Orbital Divergence Characterizes Expansive Dynamics on Biological Attractors

In the dynamical world of equilibria (fixed points in phase space) and periodic cycles (fixed points of a return map), a common concern involves their stability. What happens if an adventitious jiggle moves the orbit a little distance away from the fixed point? Would the wind wiggled suspension bridge start to flap with increasing amplitude or would it damp back down quickly to its stable state. A "Lyapounov functional," L, is constructed which can be visualized like a smooth potential bowl around the fixed point such that any L stable solution that starts at its bottom tends to stay there or is asymptotically L stable if the solution converges to the fixed point at the bowl's bottom as $t \to \infty$. If the point is not L stable, it is L unstable.

The modern study of nonlinear systems have produced another kind of stability issue with a similar appellation yielding other direction specific indices, the Lyapounov characteristic exponents, $\overline{\lambda}$ (Oseledec, 1968; Eckmann and Ruelle,1985; Ruelle, 1990; Ott et al, 1994). In this context, the instability is not one of perturbative escape from a fixed point, but of the average rate with which the (theoretically infinitesimal) distances among a handful of points representing a set of initial conditions (each a precision limited, hypothetical repetition of the same experiment), are being stretched apart by the expansive action of a strange attractor system. In three dimensions, one can envision a ball of initial conditions being elongated along the unstable direction and ironed down from both sides along the stable direction over time, transforming the ball into an ellipsoid and then into a (recurrent) curve. In simplest terms and thinking about a one dimensional scalar time series, the Lyapounov exponent reflects the multiplicative average (logarithmic addition) of the sequence of slopes of the series of straight lines connecting the points. An average slope of $> 45^{\circ}$ is expansive such that a linear distance on the x-axis is increased when mapped onto the y axis. A slope of $< 45^{\circ}$ is a contraction mapping reducing the linear distance of the x-axis when mapped to the y axis.

Rössler's generic chaotic system (see above) moving recurrently in a three dimensional box can be orthogonally decomposed into three directional motions in a moving frame, each with a signatory sign of $\overline{\lambda}$. The unstable direction of expansive stretching is characterized by some number > 0, $\overline{\lambda}(+)$, the stable direction of contractive folding, some number, < 0, $\overline{\lambda}(-)$, and the neutrally stable direction of recurrence, $\overline{\lambda}(0)$. For The "Lyapounov spectrum" of the Rössler attractor is $[\overline{\lambda}(+),\overline{\lambda}(-),\overline{\lambda}(0)]$ (Shaw, 1981). An n-dimensional dynamical systems has n one-dimensional Lyapounov exponents, and it is sometimes the case in relatively noise free, finite semi-stationary data lengths of the neurosciences, that a $\overline{\lambda} > 0$ can be shown to exist for a second one, in a dynamical situation called "hyperchaos" by (Rossler, 1979). For example, two and sometimes three $\overline{\lambda}(+)$ have been reported in the flows on the EEG attractor of normal alert subjects (Gallez and Babloyantz, 1991). The presence of measurement noise, the finiteness of neurophysiological sample lengths as well as the relatively small expansive actions in some directions in the chaotic attractors of brain dynamics lead to the finding that most often, only one "leading Lyapounov exponent," $\overline{\lambda}(+)$, is reliably computable (Sano and Sawada, 1885; Wolf et al, 1985; Eckmann et al, 1986).

A counter-intuitive fact about the stability of a dynamical system when a decrease in the value of $\overline{\lambda}(+)$ is observed such that $\overline{\lambda}(+) \rightarrow \overline{\lambda}(0)$, is that this more neutral stability augers a global bifurcation (Guckenheimer and Holmes, 1983). A small perturbation does not change the global dynamics of an already expanding and contracting (called "hyperbolic") dynamical system, it will maintain the style of its motions. However, when $\overline{\lambda}(+) \rightarrow \overline{\lambda}(0)$, a velocity changing perturbation evokes a bifurcation to a new dynamic in what is called "loss of hyperbolic stability." The best examples come from the observations of this kind of change in the EEG predicting the onset of epileptic seizures in patients with focal or temporal lobe epilepsy (Iasemidis et al, 1988,1990; Iasemidis and Sackellares, 1996).

The number and variety of algorithmic strategies for computing Lyapounov exponents that are applicable to real data divide naturally into those that compute directly the average rate of separation of neighboring points from the "fiduciary" orbit, as observed on the reconstructed attractor, from which only the largest $\overline{\lambda}$ can be obtained (Wolf et al, 1985), and a variety of techniques based on assumed model maps of the unknown flow along which the sequential products of the local derivatives are computed. The logarithms of the straight line slopes of the sequence of directionally decomposed local tangent vectors multiplied, yield as many Lyapounov exponents as directions (Sano and Sawaka, 1985; Eckmann et al, 1986; Geist et al, 1990). The techniques of regularization by which these model processes approximate the unknown flow include those with least squares, linear fit assumptions (Eckmann et al, 1986; Sato et al, 1987; Buzug et al, 1990), more detailed fits involving polynomial expressions in higher powers (Briggs, 1990; Brown et al, 1991; Bryant et al, 1991) and techniques such as "singular value decomposition" which decomposes the flow into orthogonal components before computing the logarithmic rate of divergence of nearby points on each of them (Stoop and Parisi, 1991). A clever check on the Lyapounov number obtained is to study the flow backwards so that, for example, some rate of separation of points in the forward direction would approximate the rate of convergence in the time reversed data (Parlitz, 1992).

Among the sources of spurious Lyapounov exponents are sample lengths that are too short and/or too measurement-noisy to compute a statistically stable average, embedding dimensions that are too high or low and attractors (many of physiological relevance) that have geometric features such as sharp corners or tight folds as in the Rössler (where points gather) or delicate boundary points such as those on the body on the Lorenz butterfly (see above) where very small distances determine whether the orbit makes big jumps to the right or left wing leading to uncharacteristically large separations. This "nonuniformity" in the rates of expansion and contraction in the dynamics over the attractor, a source of error in computations of statistical indices of the average behavior, becomes a useful tool in characterizing individual differences in sets of neurobiological data ranging from brain enzyme kinetics (Mandell, 1984) and single neuron firing patterns (Selz and Mandell, 1991) to human psychomotor and cognitive behavior (Selz, 1992; Selz and Mandell, 1993).

The Leading $\overline{\lambda}(+)$ of Some Biologically Relevant Time Series

An early application of a simplified form of leading Lyapounov exponent to brain data involved the computation of the one dimensional averaged slope of in vitro studies of psychopharmacological drug and peptide effects on time series of catecholamine and indoleamine biosynthetic enzyme activities studied at physiological, far-from-equilibrium reactant concentrations (Russo and Mandell, 1984b; Knapp and Mandell, 1984). A contemporaneous study also suggested the influence of differences in initial conditions for pharmacokinetic equilibrium times in drug binding kinetics by proteins (Bayne and Hwang, 1985).

The most extensive applications to the clincial neurosciences of the Lyapounov measure of the exponential divergence of orbital points has involved reconstructed brain wave attractors from the intracranial or scalp recordings of the EEG (Duke and Pritchard, 1991; Dvorak and Holden, 1991; Jansen and Brandt, 1993). Space prevents us from surveying more than a small representative set of the studies (Jansen, 1996). It should be noted, however, that this is an area in which “state of the art” research has grown quite complicated and somewhat controversial with respect to technical issues. The choices of the digitizing frequency of the smooth record, the dimension of the embedding space and time delays continue to be debated in the context of numerical computations of $\overline{\lambda}$ and dimension measures (Mayer-Kress, 1986; Ott et al, 1994).

Controls for the implicitly required statistical discrimination between “randomness” and “deterministic chaos” consist of sequence and (Fourier) phase randomization generating “surrogate data” which conserve the probability distributions and destroy the correlation properties and attractor geometries (Sauer et al, 1991; Ott et al, 1994). Since neither bring with them any connections with known or explorable brain mechanisms, one might argue that at this early stage of the work it would be more desirable to simply report the quantitative findings, leaving unanswerable questions about ultimate causality for later discussion (see below).

The first EEG $\overline{\lambda}(+)$ was reported in a patient with epilepsy (Babloyantz and Destexhe, 1986) which was confirmed by others (Iasemedia et al, 1988; Frank et all, 1990). An important study of simultaneous time series from 16 subdural electrodes placed in the right temporal cortex of a patient with a right medial temporal lobe epileptogenic focus demonstrated that a decrease in a single lead's $\overline{\lambda}(+)$ reliably anteceded and localized the first signs of the incipient seizure. The rest of the leads followed with similarly decreased positivity in their leading Lyapounov exponents associated with spatially coherent patterns of behavior. In addition, the averaged value of the leading Lyapounov exponents in the 16 leads increased post-ictally over the averaged values of $\overline{\lambda}(+)$ in the pre-ictal state (Iasemidis et al, 1988,1990). These findings, including seizure anticipation for 25 minutes, were confirmed using intracranial recordings in 16 patients with temporal lobe epilepsy (Elger and Lehnertz, 1998). The para-ictal decrease and post-ictal increase in $\overline{\lambda}(+)$ found in patients with focal temporal lobe seizures was confirmed more generally in left and right pre-frontal-to-mastoid EEG recordings made before, during and after electroconvulsive shock treatment of psychiatric patients (Krystal and Weiner, 1991). Pre-ictal changes were also found six minutes before seizure onset from scalp EEG recordings in 17/19 patients with chronic focal epilepsy (Martinerie et al, 1998). The most exciting potential application of this approach is its use, in real time, for the prediction and prophylactic treatment of incipient seizures, minutes to hours before the event, in place of or augmenting long term drug management (Iasemidis and Sackellares, 1996).

There is a growing literature about leading Lyapounov exponent(s) in the reconstructed attractor of the EEG associated with a variety of normal and pathological human behavioral states. For examples, two and sometimes three

$\overline{\lambda}(+)$ were reported in awake relaxed subjects and were lost in deep sleep (Stage IV) and coma (advanced Jakob-Creutzfeld disease), suggesting that level of consciousness correlated positively with amount of orbital divergence (Gallez and Bablioyantz, 1991). A "pathologically low" leading $\overline{\lambda}(+)$ was also found to be characteristic of the EEG of patients with Alzheimer's syndromes (Jeong et al, 1998). Technically defined sleep stages (I, II, III, IV, REM) were found to correlate well with the values of the leading $\overline{\lambda}(+)$ of the EEG in normal subjects (Fell et al, 1993; 1996; Pradhan and Sadasivan, 1996). EEG recordings during problem solving sometimes, but not always, demonstrated a relationship between values of $\overline{\lambda}(+)$ and the kind or amount of load of the task (Micheloyannis et al, 1998; Popivanovov et al, 1998; Meyer-Lindenberg et al, 1998). Both emotionally positive and negative videos increased the value of the leading $\overline{\lambda}(+)$ (Aftanos et al, 1997) as did computer generated music with sounds that exploited a "pleasing" hierarchical, 1/f but not an "unpleasant" $1/f^{\ 2}$ frequency spectrum (see previous section about power law scaling) (Jeong et al, 1998). The EEG theta rhythm of "day dreaming" manifested a lower $\overline{\lambda}(+)$ than the "relaxed alert awake" alpha rhythm (Roschke et al, 1997). Relationships between the Lyapounov spectra demonstrated both regional independence and task-related dependence in the magnetoencephalography record in man (Kowalik and Elbert, 1995).

These and other studies suggest that divergence rate of orbits on a geometrically reconstructed attractor is a subtle measure, which can be quantified as a continuous variable and which has been found to be useful in a variety of neuroscience-related, experimental contexts. The range includes the characterization of the discharge pattern of a single somatic or renal sympathetic nerve fiber (Gong et al, 1998;Zhang and Johns, 1998); quantifying the results of perturbing autonomic nervous system activity, for examples, exercise, atropine and propranolol decrease $\overline{\lambda}(+)$ in the cardiac interbeat interval attractor (Hagerman et al, 1996) and interference with the function of the baroreflex or clonidine alters the $\overline{\lambda}(+)$ in the blood pressure attractor in man and animals (Wagner et al, 1996;

Mestivier et al, 1998); and predicting defects in visual learning functions from decreases in the $\overline{\lambda}(+)$ of the cardiac interbeat interval attractor in patients with multiple sclerosis (Ganz and Faustman, 1996).

We recall that on theoretical grounds (Guckenheimer and Holmes, 1983), a decrease in the positivity of $\overline{\lambda}(+) \rightarrow \overline{\lambda}(0)$ in a delay coordinate, geometric reconstruction of a time series of observables may auger an incipient global bifurcation in the system's dynamics. As reviewed above, this has turned out to be the case in several studies of the EEG and electrocorticogram in epileptic patients. Futher research will be required to see if this idea has substance more generally for predicting "catastrophic" changes in other brain-related systems.

Power Law Scaling of Orbital Geometries in Time Series Reconstructions

Benoit Mandelbrot's book in its first incarnation was derived from his lectures at College de France in 1973 and 1974 and was called *Les Objets Fractals: Forme, Hasard et Dimension* (Mandelbrot, 1975). This essay was translated into English as *Fractals, Form Chance and Dimension* (Mandelbrot, 1977). Later expanded and reworked editions displayed another title, *The Fractal Geometry of Nature* (Mandelbrot, 1982) but the deep conceptual, sometimes poetic fusion and confusion generated by the apparent identity among the objects of his first title remains. "Fractal," along with "chaos" and "strange attractor" are among the most widely familiar new words in modern dynamical systems research. Fractal is the most difficult to rigorously define and is commonly misunderstood due to the evocative yet dream-like cognitive condensations provoked by the first title and its reflections in Mandelbrot's prose. A common conceptual confusion is exemplified by the assumed relation between "fractal time event distributions" of the cardiac interbeat interval and the "fractal like" anatomy of the purkinje network of the cardiac conduction system. Data from both contexts are often shown juxtaposed in the same illustration as though their relationships were obvious (Goldberger et al, 1990; Goldberger, 1996; Liebovitch and Todorov, 1996). "Fractal times" and "fractal geometries" are not related to each other essentially, either in the mathematical or physiological domain, but are often made vaguely equivalent on the basis of their lexical similarity.

An experimentally meaningful relationship between fractal statistics (hazard), dynamical fractals (dimension) and fractal geometries (form), has to be proven on a case by case basis and not assumed from their common designation. Among the informal attempts to do this have been those that involve the branching pattern of nerves and the associated reductions in their diameter-dependent characteristic conduction velocities yielding a multiplicity of "arrival times." There is, however, a more central idea common to these concatenated meanings of fractal: the statistical, dynamical and geometric expressions of "scaling," a word which is not mentioned in Mandelbrot's book titles. The cluster of theories, theorems and methods associated with the idea of scaling (and renormalization) have led to Nobel Prizes for Flory (1971), Wilson (1975) and de Gennes (1979) and the (equivalent mathematical) Field's Medal for McMullen (1994). There is speculation that the last two awards were supported by the inspiration and interest given their research by Mandelbrot's intuitions and books.

Scaling laws take the place of (unknown causal) physical laws by indicating the proportion by which observables of a system can be changed in relationship to each other such that some statement about them, "this varies with that," still holds. In a cross species comparison, as the average weight of a mammalian body, called lb, increases, the skeletal weight, called w, increases at an exponentially greater rate: w goes like $lb^{1.08}$ where $lb^{1.0}$ would indicate that they grew across species at the same rate. Plotting log (lb) on the x axis and log (w) on the y axis in a log-log plot results in a straignt line with a slope that indicates the power law scaling relationship between body weight and skeletal weight across mammals. The slope of the scaling exponent of 1.08 is a little over $45^{\circ} = 1$. In contrast, the metabolic rate, r, goes like $(lb)^{0.75}$, $r \approx (lb)^{0.75}$. Larger animals (relative to their weight) have lower basal metabolic rates (Schmidt-Nielsen, 1984). We don't completely know the chain of intervening mechanisms that relate these variables to each other but we do know invariant scaling laws that describe their relationships within some limits on the range of values.

In describing the functional size, radius of gyration, R_g, of a polymer such as a polypeptide, composed of N monomers, assume each of the amino acids to be the same and that they are in a "good" hydrophobic solvent that didn't stick the polymer together in a fold. Flory (1971) found a scaling law for certain broad classes of polymers and solvents, $R_g \approx \alpha N^{\nu}$, where the exponent, $\nu = 3/5$, was universal, N indicated the number of monomers in the chain and the value of "pre-factor" α depended upon the particular monomer and solvent chosen. Log R_g plotted against log N has a "power law" slope of 0.60. For an equally static but less physical example, there is the well known Zipf law of "vocabulary balance"(Zipf, 1949). First reported for the 260,450 words of James Joyce's Ulysses, the slope of the log of the rank of the words found (ordered from most to least along x) plotted against the log of their frequency (along y) results in a power law that is (generally) true for other collections of words and in other languages.

An accessible example of a dynamical scaling law arises in a two dimensional lattice model of a forest which is to be set on fire with probability p independent random single tree ignitions. At some critical p, p_c, the fire sweeps through the entire forest ("percolates") and the correlation length of the connected clusters grows as $|p-p_c|^{-\gamma}$ with a universal scaling exponent, $\gamma = 4/3$, for all Monte Carlo, two dimensional percolation problems (Stauffer, 1985; Grimmett, 1989).

Mandelbrot's scheme for the power laws that compose his fractal geometry of dynamical objects is a measure made on the pattern of occupancy in the embedding space by the reconstructed orbits of an attractor. It is, generally, $mass \approx length^{D_0}$ in which D_0 (the subscript that of the "capacity dimension") is not the whole number of Euclidian dimensions, d, of the space in which the orbits are embedded. After Hausdorff's "convergence of external and internal measures" (Hurewicz and Wallman, 1948), the (capacity) fractal dimension D_0 is also defined as being larger than its topological dimension and smaller than its Euclidian embedding dimension. Graphing a time series on a plane one can think of its topological dimension as that of a line equal to one. If each time step had the largest up or down amplitude as possible, its fractal dimension would approach (but not reach) that of the embedding plane, Euclidean $d = 2$.

The D_0 of the one dimensional Richardson technique (Mandelbrot, 1967) can be computed by covering the one dimensional surface of a time series with a number, #, of line segments of several orders of magnitude range of lengths, *l* .Graphing log(l) along the x-axis and log #(l) along the y-axis yields a negative linear slope, -s. As defined, $1 - s = D_0$ noting that $(-(-s) \rightarrow +s)$ such that $1 < D_0 = 1 + s < 2$. Strain differences and peptide and psychotropic drug-induced changes in D_0 computed in this way were found in time series of fluctuations in rat brainstem tyrosine and tryptophan hydroxylase activities under far-from-equilibrium co-reactant concentrations (Mandell and Russo, 1981; Knapp et al, 1981; Knapp and Mandell, 1983; 1984). Systematic influences of stimulant drug dose on D_0 were found as well in these systems (Mandell et al, 1982). This simple measure, made directly on the "roughness" of the graph of a one dimensional time series rather than on its orbital reconstruction, has been used to discriminate the pattern of fluctuations in daily mood scales in normal subjects and mood disordered patients (Woyshville et al, 1999). These findings confirmed dimensional scaling exponents on higher dimensional embeddings of similar time series in mood disordered patients (Gottschalk et al, 1995; Pezard et al, 1996). Due to the ease and rapidity of its computation, techniques involving D_0 on one dimensional time series are currently in development as possible real time epilepsy predictors when analyzing the output of a large number of EEG leads simultaneously.

If $M(\varepsilon)$ is the minimum number of d-dimensional cubes of side ε required to cover the d-dimensionally embedded attractor, plotting a logarithmic range of rulers of length ε (as $\varepsilon \rightarrow 0$) along the x axis and a logarithmic range of number of cubes, $M(\varepsilon)$, each of corresponding ε-edge size, along the y axis, results in a negative (more smaller $M(\varepsilon)$'s and fewer bigger $M(\varepsilon)$'s) power law slope D_0. Here the numbered covering cubes, $M(\varepsilon)$, are those in which the probability of containing at least one point (its "probability density measure," often called μ) is not zero. We note that changing the ratios of the numbers of cubes that are dense in point probability to those that are sparse would not influence the value of D_0. This helps differentiate D_0 from other dimensions and, as noted above, D_0 as a maximal estimate of the fractal dimension, is called the capacity dimension and by convention the scaling law is written $M(\varepsilon) \approx \varepsilon^{-D_0}$. More specifically, D_0 is calculated by repeatedly dividing the d-dimensionally embedded phase space into equal d-dimensional hypercubes and plotting the log of the fraction of the hypercubes containing data points versus the log of the (normalized) linear dimension ("length scale") of the hypercubes. The slope fitted to the most linear part of the slope (usually the middle 50%) indicates the capacity dimension. D_0 is computed for increasing embedding (and cube) dimension, d, until it achieves an asymptotic plateau, it "saturates". This is but one of a range of geometric scaling exponents, "dimensions," that are currently being computed (Farmer et al, 1983; Grassberger and Procaccia, 1983; Meyer-Kress, 1986; Theiler, J. (1990); Gershenfeld, 1992; Ott et al,, 1994).

Although still subject to debate, convention has it that the sample length required to determine this most primitive of dimension computations goes like 10^{D_0} (e.g. a dimension of 2.45 requires a sample length of at least 282 points). Assuming robust findings using D_0 as indicated by non-parametric tests of significance in test-retest, before and after, drug treatment designs, this arbitrary criteria sounds more like ritual than meaningful help for the clinical neuroscientist with (say) 100 spinal fluid hormone and metabolite samples painfully and laboriously collected from a patient's indwelling catheter over 48 hours. In the context of real data (and not numerical studies of differential equations), we are dealing with empirical findings that must find their meaning (or lack of) in the context of questions about issues in the neurosciences, not in abstract questions such as those about the number of dimensions that an unknown differential equation would require to represent the data (Broomhead and King, 1986). In a similar arbitrary spirit, a system manifesting a $D_0 > 5$ is considered not discriminable from a random process; e.g. the difference between $D_0 = 5$ versus $D_0 = 7$ (though perhaps statistically significant) is thought to be without meaning. Since in neurobiological research, “random” (if it doesn’t mean measurement error) indicates unknown degrees of freedom, this $D_0 > 5$ rule is also without relevance for brain research.

D_1 is called the “information dimension” and is computed by counting the number of ε-cubes, M(ε), it takes to cover the points constituting some fixed fraction of all of the points of the set of orbital points on the attractor and can be regarded as the “core dimension” (without the outliers) of the set. The counterintuitive finding is that D_1 is nearly constant across a range of fixed fractions that are less than the whole measure (Farmer et al, 1983). The invariance of D_1 can even be taken to the extreme by computing the $D_1 = \lim_{\varepsilon \to o} \frac{\ln M(\varepsilon)}{\ln(\varepsilon)}$ around (typical, not all) single points. In this context, D_1 is called the “pointwise dimension” or “singularity exponent” and, as might be anticipated, its value is usually less than that of D_0.

The scaling exponent that is both sensitive to point densities and easiest to compute from real data is the “correlation dimension,” D_2. Here, analogous to the relationship between the amplitudes of the variance and the correlation function in conventional statistics, the measure squared is of interest for the computation of D_2, e.g. $I(2,\varepsilon) = \sum_{i=1}^{M(\varepsilon)} [\mu(C_i)]^2$ (see below for this use of measure μ on sum Σ of cubes C_i). The selection of D_2 as the fractal measure dominates the studies that invoke scaling exponents to quantify the distributions of points on the attractor as reconstructed from time series in the neurosciences (Grassberger and Procaccia, 1983; Mayer-Kress, 1986; Ott et al, 1994). Several sets of programs are available for its computation (for example, Sprott and Rowlands, 1991). Generally, a correlation sum (“integral”, R(ε)) is computed from a starting point by counting all subsequent point pairs with distances between them less than ε as ε→0 and plotting $D_2 = \frac{\lim}{\varepsilon \to 0} \frac{\ln(R(\varepsilon)}{\ln(\varepsilon)}$. D_2 is computed for increasing embedding (and therefore hypercube) dimension, d, until D_2 achieves an asymptotic plateau, it “saturates” (Ding et al, 1993).

It is generally the case that $D_0 \geq D_1 \geq D_2$ (Farmer et al, 1983).

In his statistical explorations of experimental results in hydrodynamic turbulence, Mandelbrot (1974) called attention to the need for a multiplicity of characteristic scaling exponents, a range of values for each exponent and their sensitivity to orbital point density distributions (the latter called the Sinai-Ruelle-Bowen or natural measure (Eckmann and Ruelle, 1985)). These needs grew out of the intrinsic heterogeneity in the time dynamics and the nonuniform point distributions in phase space of orbitally divergent, real physical systems. Even with relatively uniform orbital point distributions, it is intuitively obvious that as $\varepsilon \to 0$, the smaller ε- cubes are over-represented and larger ε- cubes are under-represented in the M(ε) computation (Farmer et al, 1983). For a concrete example, the fraction of the total number of cubes containing say 75% of the points would obviously decrease as the ε-lengths studied gets smaller. Normalizing the D_i measures with respect to point densities would correct for this systematic distortion. In addition, the non-systematic influence of real system heterogeneity and non-uniformity in both time and reconstruction space distributions makes the need for relating the D_i measures to the natural measure even more pressing.

The derivation of many separate scaling exponents, as well as global generalized exponents and the incorporation of point densities in their computation, has been approached by a kind of method of moments (Renyi, 1970; Grassberger, 1983; Hentschel and Procaccia, 1983; Halsey et al, 1986; Mayer-Kress, 1986; Ott et al, 1994). We outline the general arguments here so that the reader will be generally familiar with the ideas and terms, not to serve as a definitive summary. It is a complicated area and the reader will find the required detailed descriptions in the references. .

We recall that with respect to a statistical distribution, the first moment is the mean; the second moment, σ^2, the variance; the third moment, σ^3, the distribution's asymmetry, the skew; and the fourth moment, σ”, its relative peakedness with respect to the probability mass in the tail, called the kurtosis. In these moment computations of an observable x_i's deviation from the mean, $|x_i - \bar{x}|^q$, the value for q accentuate particular regions of the density distribution. Similarly, the q's of the "generalized dimensions," D_q, emphasize different aspects of the relative point density that are assumed to be uniform in the computation of D_0. We recall from above that the power law slope constituting $D_0 = \lim_{\varepsilon \to o} \frac{\ln M(\varepsilon)}{\ln(\varepsilon)}$. If we emphasize the component of the probability (measure, μ) or, equivalently, time spent by the orbit in cube i, $\mu(C_i)$ instead of simply the number of cubes occupied by any points, M(ε), along with the different length scales of the cube as ε→0 we have a generalized dimension. A common expression for the generalized dimension includes the fractional pre-factor in q written so as to make things come out right: $D_q = \frac{1}{q-1} \frac{\lim}{\varepsilon \to 0} \frac{\ln I(q,\varepsilon)}{\ln(\varepsilon)}$, where $I(q,\varepsilon) = \sum_{i=1}^{M(\varepsilon)} [\mu(C_i)]^q$. The higher the q, the greater the dominance of the higher probability cubes, $\mu(C_i)$. To see how this q-induced separation in emphasis might work, if the ratio for q = 2 between the probability containing cubes 0.25 and 0.05 is 25, their ratio for q = 3 is 125. For q = 0, the scaling exponent is the capacity dimension. This result of the actions of a changing q has been analogized to the way changing temperature in a thermodynamic system evokes different aspects of its behavior.

The "multifractal formalism" generally begins by determining the statistical densities over a range of scale lengths by one means or another including wavelet transformations across wavelength scale (Arneodo et al, 1988). These densities by scale are then systematically raised to a range of q exponents. Since q, and therefore D_q, can vary continuously, functions are created that shows how D_q varies with q. These are then further transformed, resulting in a single maximum parabolic curve whose shape and size is sensitive to the conditions of the experiment (Halsey et al, 1986). Generalized dimensions decrease as q increases. A unique neuropsychopharmacological application of the multifractal technique to a study of the behavioral influence of increasing amounts of cocaine on the time-dependent patterns of spatial exploration, temporal-spatial fluctuations, in rats, demonstrated a global splitting in the parabolic distribution suggestive of a cocaine-induced global phase transition, not unlike the well-known, dose-dependent, amphetamine-induced shift from hyperactivity to motor stereotypy (Paulus et al, 1991). Studies that followed demonstrated that “q-moment” distributions of heterogeneous scaling exponents and their relative statistical weightings were useful in making subtle discriminations between effects of psychopharmacological agents and behavioral (isolation) influences on animal behavior as well as patterns of simple psychomotor behavior in normal subjects and schizophrenic patients (Paulus et al, 1994; 1996; 1998; Krebs-Thomson et al, 1998a; 1998b).

Fractal Scaling Measures on Reconstructed Time Series from Biological Dynamics

Publications involving the applications of various D measures, particularly D_2, to brain-relevant times series number in the hundreds and are growing exponentially. The following constitutes a brief review of a representative set of empirical findings. In doing so, for the reasons discussed below, we ignore what some might consider the rather abstract and philosophical issue of “determinism” versus “randomness” or “error” (Sugihara and May, 1990; Casdagli, 1991; Wayland et al, 1993; Kaplan and Glass, 1992; Kaplan, 1994) since this question is relatively unproductive with respect to generating new neurobiological insights, novel experiments or new quantitative approaches to brain dynamics. In addition, as noted in the final section, this discrimination may not even have definitive theoretical meaning in that the conduct of much of the rigorous mathematics about “deterministic dynamical systems” involve Markoff partitions and matrices which are also the generic operators of formal probability theory (Sullivan, 1979; Kolmogorov, 1950). For example, N-dimensional non-linear Markoff processes can be shown to capture the dynamics of multidimensional neurobiological processes such as the EEG (Silipo et al, 1998).

We have also ignored the related issue of the presence or absence of “low dimensional structure” (Theiler and Rapp, 1996; Rapp, 1995) which, from the authors’ point of view, resulted from an unfortunately concrete interpretation of the word “dimensions.” With respect to experimental brain data, dimensions are defined most relevantly by their computational procedures and what are computed are empirical scaling exponents describing real observables as limited by the precision of the observations, their resolution and series lengths (Smith, 1988; Eckmann and Ruelle, 1992). The "correlation integral," the probability that two vectors chosen at random from the phase space reconstruction lie within "r" distance of each other, not unrelated to the phase randomization controlled, D_2 measure, yields statements about amount of "nonlinearity" (not accountable by the linear regressively capturable component of the power spectrum), which are also difficult to translate into experimentally or theoretically useful concepts (Casdagli et al, 1997). These efforts contrast with a more direct attempt to establish a spiking neuron system's dynamical "dimension" using trial and error prediction in which "dimension" was defined as the number of potentially physiologically relevant variables required to make the predictive equations fit (Segundo et al, 1998).

Computations of scaling exponent descriptors of orbital point distributions on reconstructed attractors of the brain sciences have proven to be most useful as atheoretical, empirical techniques discriminating experimental, clinical and/or treatment conditions with various approaches to statistical significance. In this regard, one can say that D_2 is often found to be superior to central tendency oriented statistics in making these discriminations. Dimension and correlation integral descriptors appear least useful when dealing with global issues such as chaos, randomness, linearity and the "underlying dimensions" of (unknown) differential equations. We discuss below the possibility that the failure to find chaos in the more recent EEG studies (Theiler and Rapp, 1996; Prichard et al, 1996) may be because the EEG attractor is better characterized as a "strange nonchaotic atttractor" with orbital patterns manifesting fractional scaling exponents but no $\overline{\lambda}(+)$ (Grebogi et al, 1984; Mandell and Selz, 1993).

The relatively subtle influence of high altitude (Mt. Everest) oxygen concentrations was not seen in the central moments of the cardiac interbeat intervals, but the D_2 of the attactor was reduced significantly (Yamamoto et al, 1993). The latencies and amplitudes of the visual evoked potential failed to discriminate normal subjects from those with early glaucoma, but the reconstructed attractor of the steady state visual cortical response to full field flicker demonstrated a statistically significant decrease in D_2 (Schmeisser et al, 1993). Marginal qualitative differences in optokinetic nystagmus were quantitatively significant when studied as the D_2 of the attractor's points in patients with vertigo compared with controls (Aasen et al, 1997). Reconstructions of maximum velocity waves from Doppler studies of middle cerebral artery hemodynamics (using phase random "controls") demonstrated an increase in D_2 (and a decrease in $\overline{\lambda}(+)$ correlated with age in an adult population (Keuner et al, 1996; Vliegen et al, 1996). D_2 served as a sensitive descriptor of functional changes in the EMG from the surface of the biceps muscle, increasing with muscle load and rate of flexion and extension and decreasing with muscle fatigue (Rapp et al, 1993; Nieminen and Takala, 1996; Gupta et al, 1997), suggesting its use in suspected early myotonic dystrophies and myasthenias. Reconstructed time series of stomatognathic motions in high school students with temporomandipular joint syndromes compared with those with malocclusion revealed a specific decrease in D_0 in the plane of horizontal motion in the former (Morinushi et al, 1998). Time series of plasma growth hormone levels in acromegalic patients with functioning pituitary adenomas manifested a statistically significant increase in D_0 when compared with age-matched controls (Mandell and Selz, 1997) which corresponded nicely to the reduction in "approximate entropy" (Pincus, 1991a) computed on this same data set (Hartman et al, 1994). On the other hand, comparative in vitro studies of growth hormone release patterns in normal rat pituitary cells and their neoplastically transformed relatives, the GH3 strain, demonstrate a decrease in D_0 in the latter (Guillemin et al, 1983; Mandell, 1986).

The number of examples of the use of D_2 on orbital point geometries in explorations of physiological and pharmacological regulation are increasing. The D_2 of respiratory rhythms is higher with intact vagal afferents than without (Sammon and Bruce, 1991). Histamine induced an increase in D_2 in the attractor point distribution of rabbit ear artery vasomotion, attributed to calcium-activated membrane potassium channels in that TEA prevented and reversed the change

(Edwards and Griffith, 1997). The role of central and autonomic innervation in cardiac interval dynamics has been explored using D_2 in various ways. For examples, the transplanted heart rhythm in man has a lower D_2 than that of the normal heart (Guzzetti et al, 1996) and general anesthesia and cholinergic (but not β-adrenergic) blockade decreased multisystem D_2 in a series of multiparameter (respiration, mean blood pressure and heart rate) studies in piglets (Zwiener et al, 1996; Hoyer et al, 1998).

The activities of single and aggregates of neurons are being described and differentiated by the D_2 of their interevent interval attractors. Early and important studies related to both neuronal and field electrical activity indicated their promise (Rapp et al, 1985; Zimmerman and Rapp, 1991). The olefactory bulb demonstrated spatially uniform scaling dimensions that changed with event-related perturbation (Skinner et al, 1990). An iron-induced spiking focus in the rat hippocampus in vivo manifested the same decrease in D_2 as it did in the kindled in vitro hippocampal slice (Koch et al, 1992). D_2 also differentiated among characteristic single unit time series in norepinephrine, dopamine and serotonin neurons (Selz and Mandell, 1991) and among A8, A9 and A10 dopamine neurons (Selz and Mandell, 1992). Attractors reconstructed from single unit interspike intervals in the substantia nigra pars compacta and the auditory thalamus manifested discriminatable values for D_2 in neurons recorded by the same electrode (Celletti and Villa, 1996) and changes in state manifested in patterns of subthreshold oscillations in single neurons in the inferioir olivary nucleus could be characterized using this index (Makarenko and Llinas, 1998).

D_2 reliably discriminated between states of arousal and between the multiparameter (eye movements, neck muscle tone, EEG stage) defined EEG stages of sleep (Bablyoyantz, 1986; Rapp et al, 1989; Ehlers et al, 1991) with non-REM having a lower D_2 than REM. D_2 of the EEG record was selectively reduced in Stage II and REM in schizophrenic patients compared with controls (Roschke and Aldenhoff, 1993), this difference was made more prominent by treatment with the aminodiazopoxide, lorazepam (Roschke and Aldenhoff, 1992). In the waking state, higher EEG D_2 values were frontal in schizophrenic patients and more central in controls (Elbert et al, 1992). The D_2 computed on the EEG during Stage IV ("delta") sleep was sensitive to acute sleep deprivation and recovery, but demonstrated compensation (Cerf et al, 1996). Non-alcholic children of alcoholic parents manifested lower values for D_1 in their EEG attractors than the children of a normal control group (Ehlers et al, 1995). Higher I.Q. correlated with EEG D_2 in most leads in the resting state but not during a visual imagery task (Lutzenberger et al, 1992). These differences also correlated with individual differences in task performance in a perceptual pattern predictive task (Gregson et al, 1990) and with a working memory task load with regional differences most marked in the right fronto-temporal cortex (Sammer, 1996).

Peripheral nerve stimulation in the earlobe and trapezius muscle induced increments in D_2 in the EEG of specific brain regions (Heffernan, 1996). Memory for but not induced pain increased EEG D_2 in chronic pain patients but not in normal controls (Lutzenberger et al, 1997). Using contingent reinforcement of brain wave modes by hypothalamic, but not cerebral hemispheric, stimulation reduced D_2 in the EEG (Mogilevskii et al, 1998) resembling the changes accompanying defensive reflex conditioning in the rabbit between the early and late stages of the process (Efremova and Kulikov, 1997). Difficult to diagnose "periodic lateralized epileptiform discharge" syndromes have apparently yielded to D_2 computations (Stam et al, 1998). In equally problematic "atypical seizure" syndromes in children, D_2 computed on the autocovariance functions of 200 Hz digitized EEG records from multiple channels demonstrated characteristic changes (Yaylali et al, 1996).

Unlike computing a reliable leading $\overline{\lambda}(+)$ on a point set of a time series reconstruction denoting the "sensitivity to initial conditions" requirement for the diagnosis of chaos (and a potential for change such that a decrease in the positivity of $\overline{\lambda}(+) \rightarrow \overline{\lambda}(0)$ may auger a nearby bifurcation), the presence of a fractional scaling exponent, D_i, does not in and of itself implicate a chaotic dynamical state. A nice example of a nonchaotic dynamic with $\overline{\lambda} = 0$ that has a fractional scaling exponent, D = 0.538, is the "Feigenbaum" point where the above noted "infinite" series of period doubling bifurcations accumulate (Grassberger, 1981). This is a dust-like region, which when endlessly dilated looks like the same dust. Some mathematicians call these objects "Lebesgue points" because even though at low magnifications when they look rather solid, they are not. Composed of points, they have topological measure zero (a line has measure one) and non-integer fractal dimension. These $\overline{\lambda}=0$, D $\neq$ Integer, period doubling accumulation points can be found in a wide variety of attractors, though in each case the parameter space in which they are located is so small (in point set topology also called "Lebesgue measure zero") that they are very difficult to locate and therefore have little chance of being physiologically significant.

This constrasts with a relatively new category of dynamical systems which promises to be important in studies of the nervous system. These are ones that are driven by two or more independent frequencies (called quasiperiodic driving). We found them to be relevant to brain stem, thalamocortical neurophysiology of perceptual processes and states of consciousness. They have the properties, $\overline{\lambda}=0$, D_0 and D_1 $\neq$ integer and a characteristic scaling "spectral distribution function" (see below). They have been named "strange nonchaotic attractors" (Grebogi et al, 1984; Romeiras et al, 1987; Ding et al, 1989). In addition, the strange nonchaotic behavior of these quasiperiodically-driven, nonlinear oscillators has positive (>0) measure in parameter space and thus is of potential physiological significance. A good demonstration of a multiple frequency driven strange nonchaotic attractor can be found and manipulated in the software package of Nusse and Yorke (1991).

The neurobiological substrate for this system is the brain stem neuronal modulatory driving of on- going thalamocortcal oscillatory brain waves (once called "recruitment waves" in the 7-14 Hz, θ to α, day dreaming to quiet alert range) and as perturbed by multifrequency driving in what was once called "reticular formation arousal" are realized as dominant EEG modes and associated states of perceptual acuity and consciousness (Moruzzi and Magoun 1949; Moruzzi, 1960; Klemm, 1990; Steriade and McCarley, 1990; Contreras et al, 1997). In addition to intrinsic multiply periodic and aperiodic oscillations of thalamic and cortical cells and their recursive, feedback coupling, the brain stem manifests more than two orders of magnitude of "independent" neuronal driving frequencies ranging from serotonin discharges at 1 Hz, cortically direct dopamine and norepinephrine neurons in the 10-50Hz range and mesencephalic reticular neurons discharging as fast as 100 to 200 Hz. The "thalamocortical brain wave oscillator" as their target has been a fixture in global state neurophysiology since the 1940's and 1950's and is of great current interest (Fessard et al, 1961; Bazhenov et al, 1998). We have explored the relationships between strange nonchaotic dynamics and brain-stem neuronal and thalamocortical physiology from the standpoint of neuronal coding and the properties of the EEG attractor. (Mandell et al, 1991; Mandell and Kelso, 1991; Mandell and Selz, 1992; 1993;1994;1997a). We found that the EEG attractor could be characterized by the diagnostic triad identifying strange nonchaotic attractors: $\overline{\lambda} = 0$, D_0 and $D_1 \neq$ Integer, and a signatory power spectral distribution in which the number of peaks, N, with amplitudes greater than ϖ, $N(\varpi)$, went as $\varpi^{-\alpha}$, $1 < \alpha < 2$ (Romeiras et al, 1987; Mandell et al, 1991). In addition to being consistent with known multifrequency, brain stem driving of thalamocortical oscillations, the EEG as a strange, nonchaotic attractor is intuitively appealing in that it has the necessary mechanisms for the power law scaling of a wide range of characteristic times (D_0 and $D_1 \neq$ Integer) from picosecond fluctuations of neural membrane proteins to the decades of bipolar phenomena and since $\overline{\lambda} = 0$, the orbital points don't tend to "mix"(get out of order) on the attractor, thus protecting the fidelity of sequence dependent brain information transport (Berns and Sejnowski, 1998).

Entropies, Unstable Periodic Orbits and Shadowing; Short Time Series Can Discriminate Experimental Conditions in Studies of Biological Dynamics

We avoid the temptation to deal with the deep analogy between thermodynamic entropy (Clausius, 1897) and information theoretic entropy (Shannon and Weaver, 1949), constraining our discussion to the context of an operational equivalence (in healthy systems) between gain of information and decrease in entropy in brain-relevant dynamical systems. As we shall see, certain pathophysiological processes appear to manifest themselves as reductions in background or "resting" state entropy which then limits its supply with respect to information gain and/or transport. Relationships between "physical" thermodynamic observables, such as changes in heat capacity or temperature dependence of kinetic constants, and information-transport driven, neurotransmitter evoked conformational changes in neural membrane proteins may someday come together in an experimentally productive way (Hitzemann et al, 1985; Zeman et al, 1987; Borea et al, 1988), but they are beyond the scope of this paper.

The idea of taming the orbit of an expanding flow (with at least one $\overline{\lambda}(+)$) by partitioning the geometric space supporting its actions, its "manifold," and then labeling each box so that its trajectory is representable by a symbol string of box indices is the way "symbolic dynamics" are applied to dynamical systems. Symbolic dynamics arose in pure mathematics in the context of obtaining a one-to-one, topological (sequence not distance preserving) representation of a difficult to characterize system of "geodesics on surfaces of negative curvature" (Hadamard, 1898; Morse, 1917; Morse and Hedlund, 1938). Geodesics here are the shortest lines in this curved, non-Euclidean space in which nearby lines spread apart and far away ones came together with (in Euclidian space) parallel lines meeting at infinity.

Remarkably, symbolic dynamic encoding of the motions on this abstract manifold of negative curvature also capture how uniformly divergent (and convergent), "hyperbolic" chaotic systems, such as brain systems, behave in Euclidean space, an intuitive similarity about which Poincare experienced his famous vacation bus trip epiphany (Stillwell, 1985). It should also be noted that encoding neural spike trains in one dimension for symbolic dynamical comparisons of sequence structure and recurrances, "favored patterns" has been developed independently of orbital dynamics on manifolds (Dayhoff, 1984; Dayhoff and Gerstein, 1983a; 1983b). A similar approach has been used to characterize firing patterns and their response to acupuncture in dopamine neurons in the substantia nigra and hypothalamic neurons (Chen and Ku, 1992).

For real neurobiological data, a time series and its n time delays are first reconstructed as a trajectory in an n+1 dimensional geometric embedding space and, following partition of that geometric space into n+1 dimensional lettered boxes (the choice of partition being a sensitive step), what was once an orbit has become a sequence of symbols. Dynamical systems in geometric space become symbolic dynamics in sequence space. It was Kolmogoroff (1958) who first applied Shannon's ideas of entropy and information (Shannon and Weaver, 1949; Khinchin, 1957) to the quantification of these dynamical system's telegraphic messages as discrete, "stochastic" (random, probabilistic) output. Kolmogoroff turned to Shannon entropy, $-\sum p_i \log p_i$ (where p = 1/n and n = number of possibilities) to decide the question whether a dynamical system that naturally partitioned into a two or three box system per unit time had the same entropy. His answer was no, that –3(1/3 ln (1/3)) = 1.098 > -2(1/2 ln (1/2) = 0.6931 $\log_e$ and in computer relevant $\log_2$, 1.5850 > 1.0 (Kolmogorov, 1959). Entropy increases with possibility.

Nonlinear differential equations representing brain-relevant expanding dynamical systems replace Shannon's linguistically weighted and serially ordered, Markoff-dependent random number generator of probabilistic language. As noted above, in the case of the Sharkovskii sequences (Sharkovskii, 1964; Metropolis et al, 1973; Misiurewicz, 1995), a small change in the single parameter of an entire class of single maximum maps generating motions that are coded from their position at the left or right of center of the unit interval, alters and determines precisely the periodic output such as {1,0,0,1,0,1,1,0,0,1,0,1...) of its binary message. In higher dimensional examples such as the Rössler and Lorenz systems, one can visualize the joint actions of $\overline{\lambda}(+)$ and $\overline{\lambda}(-)$ moving the trajectory so as to both enter, "create," new boxes and generate new letters as well as visit old ones, unstable fixed points, thus forming unstable periodic orbits. The latter, one of three diagnostic features of chaotic attractors (see above), can also be seen as resulting from the "coarse-grained" imprecision of real world neurobiological measurement such that two points that are brought close to attractive-repelling points are, within measurement error, recorded as having the same value.

Problems of measurement precision, amplified by the expansive actions of systems that are sensitive to initial conditions, yield parameter sensitive entropies of two (mathematically) fundamental kinds called topological and metric entropies, h_T and h_M, proven to be the upper and lower bounds of any estimate of the entropy in a uniformly expanding and/or equidistributed system (Adler and Weiss, 1965). Measures of entropy, as “missing information related to the number of alternatives which remain possible to a physical system” (Boltzmann, 1909), “index of probability” (Gibbs, 1902) or the “amount of uncertainty associated with a finite scheme” (Khinchin,1957) are obviously sensitive to the partition rules and its fineness of the grain. The most theoretically defensible partition is called the “generating partition” in which no box contains more than one point. Comparisons of control and experimental data can be differentially sensitive to partition construction, so that if a generating partition is not practicable due to sample length or dense curdling in the point distribution, some arbitrary choices have to be made. These have included naturally renormalized variational partitions, such that in one dimension the boxes are defined by ±1, ±2, ±3,…standard deviations, or quartiles or quintile, above and below the mean and in n dimensions. Partitions have also been constructed and used to described drug effects on rat exploratory behavior by sequential partitioning along the dimension of the highest remaining variation (after the previous partition) called the “KD” partition (Paulus et al, 1991). Partition strategies to capture entropic measures on serial ordering (Klemm and Sherry, 1981; Strong et al, 1998) can grow from knowledge or hypotheses about the physiological sources of temporal irregularities and discontinuities in brain dynamics including characteristic interval(s) of refractoriness, relaxation times of the inhibitory surround, correlation time in dendritic tree summation, the time course of reciprocal inhibition and its decay and chemical influences such as the synaptic half-life and time of action of inhibitory influences such as GABA on cell firing.

The logarithmic growth rates of occupancy of new symbolically indexed boxes or, equivalently, the growth rates of visitations to old ones generating unstable periodic orbits, are called topological entropies, h_T . They record new happenings, the growth rate of the diversity of orbits, and not how likely with respect to box occupancy densities they are likely to occur (Adler et al, 1964; Alexeev and Jacobson, 1981; Cornfield et al, 1982; Ornstein, 1989; Ruelle, 1990). The close relationships in real brain observables between the appearance rate of new symbols or new unstable periodic orbits, h_T , and log $\overline{\lambda}(+)$, reflecting the rate of divergence from the next expected value generating a new, unexpected value, is not surprising. In fact, a maximal estimate of the entropy of a dynamical system, h_T = log $\overline{\lambda}(+)$ whereas the largest value that h_M can attain is log(#of states). A great deal of substantial mathematics has gone into proofs that similarities ("equivalence relations") and differences between dynamical patterns are robustly indicated by differences in h_T and h_M (Adler et al, 1977; Adler and Marcus, 1979).

If the sum of the densities in each j box were normalized so as to sum to 1.0, such that each is a probability, p_j , then - Σ $p_j \log p_j$ represents the metric entropy, h_M. h_M was first described in the dynamical context by Kolmogorov (1958;1959). The sum having a –1 prefactor converts the negative log of < 1 to a meaningful positive value in the expression. h_M is maximal for the equidistributed, uniformly expansive, C or Axiom A systems (see above). As noted above, generally h_T = the maximum estimate of the entropy and h_M the minimum estimate (Adler and Weiss, 1965). $h_T = h_M$ in uniformly hyperbolic systems (Bowen, 1975) and the difference, $|h_T - h_M|$ is an index of non-uniformity found useful in discriminating among classes of single neurons from their discharge patterns (Mandell, 1987; Selz and Mandell, 1992; Mandell and Selz, 1993; Mandell and Selz, 1997a). These measures applied to temporal and spatial patterns of rat exploratory behavior have been used to discriminate among stimulant drug effects (Paulus et al, 1990; Paulus and Geyer, 1992). Similar computations involving the symbolic dynamics and disallowed transitions have been used to study the complexity of the the EEG (Xu, 1994) in which both extremely low (fixed point, periodic) and high (Gaussian random) entropies are seen as manifesting low "complexity as a function of the diversity of the available patterns of behavior (Crutchfield and Young, 1989a).

Before describing the simple but definitional matrix operations for h_T and h_M below which might seem forbidding to those "not up on their linear algebra," we note that procedures such exponentiation of a matrix can be carried out automatically using computer algebra programs such as Maple or for data processing available as computational modules in MatLab.

One of the techniques for the computation of h_T involves determining the logarithm of the asymptotic growth rate of the major diagonal ("trace") in the transition matrix symbolically encoding the trajectory which would therefore count the "self visitations" of each indexed boxes as the dynamics proceed. This involves setting up a transition incidence matrix, each box scored for a disallowed, 0, or allowed, 1, transitions and the matrix is exponentiated t times with the logarithm of the asymptotic growth rate of the sum of the diagonal values serving as a (leading eigenvalue) estimate of h_T. More technical considerations involving the Frobenius-Perron theorem guaranteeing the existence of such an logarithmic index of new information generation rates, even in random matrices (Seneta, 1981), will not be discussed here.

We have found that computing h_T in this way is empirically useful for difficult to obtain or only transiently stationary brain data series. Even with relatively short samples lengths, if one is willing to make the pragmatic assumption of "temporary stationarity" or "things as they are right now will, for the sake of argument, go on forever" (perhaps the best we can do with intrinsically transient brain phenomena) then this "freeze framed" representation of reality yields an asymptotic measure on relatively short sample lengths since they are computationally infinite. A similar approach to h_M, requires repeatedly exponentiating a Markoff matrix constructed from relatively short samples and generates the probabilistic (eigenvector) "dual" of $h_{T.}$ h_M computed in this way serves as a useful quantity, h_M called by some the Kolmogorov entropy in comparisons of control and experimental conditions of the same sample lengths. Systematic decreases in h_M ("Kolmogorov entropy") have been shown to accompany increasing "depth" of sleep using standard sleep staging techniques (Gallez and Babloyantz, 1991) and increases in h_M were associated with both positive and negative emotional states induced by movies (Aftanas et al, 1997).

h_T and $\overline{\lambda}(+)$ have been analogized to what is called algorithmic complexity, which quantifies a computer algorithm's minimal representation of a symbol sequence as it grows longer (Chaitin, 1974; Bennett, C.H., 1982; Nicolis, 1986; Rissanen, 1982; Crutchfield and Young, 1989b). Examples of applications of a pseudocomputational compression scheme have quantified differences among protein sequences (Ebling and Jimenez-Montano, 1980), discriminated therapist-directed "transference" manifestations in verbally encoded processes in psychotherapy (Rapp et al, 1991), characterized neural spike train patterns in a penicillin kindled spike focus (Rapp et al, 1994), differentiated among spike sequence patterns of biogenic amine families of brain stem neurons (Mandell and Selz, 1994) and as a sample length-dependent rate, in content-free, mouse driven computer tasks differentiated borderline from obsessive-compulsive personality patterns (Selz and Mandell, 1997).

Computation of lexical complexity is a good example of this approach. This procedure recursively surveys the sequence of symbols for the longest word, where "words" are subsequences that appear at least three times if they contain two letters or at least twice if they contain more than two letters. Upon finding a longest repeated word, the compression algorithm replaces all occurances of this word with a single distinct (new) symbol and looks again for the longest repeated word in the modified sequence. When the sequence cannot be further recursively compressed, there may remain identical adjacent symbols in the sequence. These are coded as the symbol raised to the power of the number of its adjacent occurances. This exponent cannot exceed five because six adjacent identical symbols would be two occurances of a three letter word. The numerical value of the lexical complexity is simply the sum of the number of distinct symbols and the (sum of the) logarithm of the exponents of the symbol sequences (Ebling and Jimenez-Montano, 1980).

A clear account of algorithmic and lexical complexity in relationship to other measures of "complexity" in the context of brain relevant research data can be found in Rapp and Schmah (1996). The relationship between thermodynamic and ergodic, measure theories in relationship to forced-dissipative dynamics and the role of self-intersection on manifolds in this new source of irreversibility (with a resulting "arrow of time") is developed in Mackey (1992).

As noted, the skeleton which configures attractors is composed of unstable, "saddle" fixed points, each of which attract (iron down) the trajectory along one dimension and repel or spread it out along another. Systems fulfilling the criteria for a chaotic dynamical system have the property of a countably infinite number of unstable periodic orbits composed of these unstable fixed points. Depending upon parameters, the orbital points can pull up their tails to be discrete with respect to each other or spread along the unstable direction to connect smoothly with others along a curve such as a saddle cycle. Parametric control of the strengths and structures of the saddle point skeleton of typical attractors can be used to change both the rate of generation of novel symbols as well as recurrances to old ones in the symbolic dynamics generating a brain dynamical system's lexagraphic products (Bowen, 1978; Alexeev and Jacobson, 1981)).

Using a variety of techniques to algorithmically register "return times," experimental condition-sensitive "saddle orbits" composing unstable periodic orbits have been demonstrated in geometric reconstructions of real data series generated by a 40+ component chemical reaction (Lathrop and Kostelich, 1989), in response to natural stimuli in the time dependent behavior of the crayfish caudal photoreceptor (Pei and Moss, 1996) and in the interburst interval sequences recorded in hippocampal slices of the rat (So et al, 1997; So et al, 1998). If the reader uses the software listed above to simulate the time evolution of one of these attractors of abstract or real systems , she will learn that a remarkably small number of points, a very short time sample, will outline, "shadow" (Bowen, 1978), the complete array of unstable fixed points before filling in the attractor. It is tempting to speculate about the potential nervous system relevance of this dynamical anticipation of the attractor's recognizable geometry, as well as a precis of what the symbolic dynamics are going to say occurs many time steps before filling in the attractor and its asymptotic message. Values of the measures made on the early unstable periodic orbit arrays such h_T , h_M and $\overline{\lambda}(+)$, resemble very closely those made on their attractors when they were much more densely filled (Lathrop and Kostelich , 1989). Bowen's "shadow lemma" in support of a thin film of points over the skelton of unstable fixed points of attractors is the fundamental reason that short sample length time series can often discriminate between control and experimental conditions in brain research studies.

Another recently implemented entropy, called "approximate entropy," is exploiting the underlying unstable fixed point skeletal shadowing principle in expansive dynamical systems to find statistically significant differences between control and experimental results in reasonably short, physiologically realistic, sample lengths (Pincus, 1991; Pincus et al, 1991). This algorithm is somewhat derivative of those involved in the computation of the correlation dimension (see above). Instead of computing across a range (and taking the limits) of embedding dimensions, d, and sequential paired-vectorial distances, ε, it empirically tailors and fixes them to compute a "logarithmic likelihood" that points remains close through incremental change in the time series. The "approximate entropy" is not easily relatable to either h_T and h_M. One is tempted to predict that this geometrically oriented algorithm might be fooled into a postive entropy diagnosis if applied to strange, nonchaotic dynamical systems with fractal dimension but no $\overline{\lambda}(+)$-related mixing. Since sequence position is conserved in this computation, two simultaneously studied ("multiparameter") systems can be examined for their mutual coherence as the "cross approximate entropy." Among the interesting findings from applications of this index to neuroendocrine studies are an increase in approximate entropy in LH and FSH secretory patterns with age in both sexes, perhaps quantitatively heralding menopause (Pincus and Minkin, 1998) and decreased cross approximate entropy, a decrease in regulatory coupling between ACTH and cortisol secretion patterns in patients with Cushing's syndrome (Roelfsema et al, 1998).

Among the many of other empirically derived entropies, one is called "power spectral entropy," which is equivalent to the normalized variance of the distribution of frequencies in a power spectral transformation of a time series (Farmer et al, 1980). This has been successfully applied to brain enzyme and receptor fluctuations

(Russo and Mandell, 1984a; Mandell, 1984), and, more recently, to multiple simultaneously EEG leads which demonstrated focal increases in epileptic patients (Inouye et al, 1991; 1992). An entropy derived from the quantification of the failures in temporal forecasting of EEG signals increased in the fronto-temporal region with drug treatment in patients with Alzheimer's syndrome (Pezard et al, 1998).

With respect to their implications for the clinical neurosciences, changes in dynamical entropy in behavior of brain dynamical systems has been regarded in two general ways: (1) Since representation of information requires the resolution of relevant ambiguity, a nonrelevant and global reduction in the dynamical entropy of a brain system (Stage IV sleep EEG slow waves, neuronal fixed point or regularly periodic activity, extrapyramidal motor tremor, fixed paranoid or obsessional mentation, the actions of some anxiolytics and antipsychotics) reduces its potential for information encoding and transport. In contrast, "arousal" induced increases in the measures of entropy in brain wave and neuronal discharge patterns (pre-task warning signals, motivating conditions, stimulant drugs) are associated with improved psychophysical receptive and discrimination functions, learning rates and memory. (2) Regarding as potentially pathophysiological both of the two extremes of entropy generation, fixed point and periodic behavior as the lowest and fair coin flipping, "Bernoulli" randomness as the highest, another descriptor, "complexity" is defined as maximal (optimal) midway through the entropy range, making a new kind of parabolic entropy curve (Bennett, 1986; Crutchfield and Young, 1989a).

In analogy with an optimal amalgam of periodic rotations and coin flips, in higher dimension, the most meaningful maximum complexity of real, nonuniformly expansive processes may derive from a multiplicity of measure invariants, symmetries, of the system such as the growth rate of unstable periodic orbits, divergence of the tail of a density distribution and specifiable linguistic variables such as word length and redundancy. The more symmetries, the more potential for complicated information encoding and transport with the maximum complexity located midrange in each one. We have pursued the hypothesis that entropy is a conserved property in the healthy brain and that complementarity in other statistical measure mechanisms make that possible. For example, in uniformly expansive, idealized systems, topological entropy has been proven be equivalent to the product of an index of expansion and the dimension of the support such that an increase in expansiveness , $\overline{\lambda}(+)$, is compensated by a decrease in D_0 leaving h_T invariant (Manning,1981). This relationship has also been found in the behavior of some nonuniformly expansive neuroendocrine, neuronal and human behavioral systems (Mandell and Selz, 1995; Smotherman et al, 1996; Mandell and Selz, 1997a;).

Is Randomness Versus Determinism a Productive Question for the Biological Sciences? Are There Better Ones?

Measures made on realistically nonuniformly expansive behavior of dynamical systems emerging from nonlinear differential equations and that arising from a variety of non-classical random walk models overlap such that making what may be more a metaphysical discrimination at this point is labor intensive, contentious and unproductive for generating new experimental work in the neurosciences. It is important to note that random walk theory and computation has matured to such an extent that almost any "nonlinear dynamical behavior" can, with respect to statistical measure, be modeled using one of many varieties. For examples, power law distributions in continuous time random walks (times of movement are also randomly chosen) , random walks with traps (temporarily immobilizing the trajectory like unstable fixed points), random walks in random environments, time of passage of ants in a labyrinth and Levy leaps and local diffusive exploration (looking for a wallet) among many others can represent much of the irregular behavior we observe in the brain (Shlesinger et al, 1982; Montroll and Shlesinger, 1984; Hughes, 1995; Klafter et al, 1996). On the other hand, (Markoff) partition of the sequence and a probabilistic style of analysis of nonlinear dynamical systems has been a major strategy for description and quantification from the field's beginnings (Parry, 1964; Adler and Weiss, 1967; Bowen, 1970; Lasota and Yorke, 1973). The issue of randomness versus determinism remains current although many if not most properties of deterministic dynamical systems can be simulated with a suitably constructed random process and all of our random number generators are deterministic.

This theoretical blind alley is reminiscent of the decades lost partialing out causal attributes of nature versus nurture before knowledge of dynamical influences on nucleotide dynamics was available. It is perhaps unfortunate that for finite length real data, “house keeping requirements” (Ruelle, 1990; Rapp, 1993;1994) and “warnings on the label” with various random sequence, random phase controls (“surrogate data”) have become so intimidating to those of us in the early stages of exploring the use of these theories and methods in the brain sciences. Currently the “controls” are more relevant to abstract statistical processes and what can be said about them rather than generating and addressing new claims and the controls for them related to quantitatively oriented, experimental brain physiology.

Statistical caveats have arisen to retard the emergence of potentially important and robust neurophysiologically-relevant phenomena. For example, a recent well conducted and analyzed study of the influence of low doses of ethanol in 32 normal male subjects, which honored almost all of the current analytic rituals including sequence and phase randomized surrogate data and searches for the continuity features of deterministic dynamical systems such as time asymmetry, concluded that the drug “reduced the evidence for nonlinear dynamical structure” in the brain (Ehlers et al, 1998). Though honoring the currently popular statistical rituals, what appears to be missing here are suggestions for new neurobiological or mathematical intuitions that will lead to the design of the next experiment.

We now see that it is now possible to use these new ideas and methods to ask and at least partially answer more specific questions relevant to the clinically oriented neurosciences such as: whether increases in lithium-induced expansiveness and mixing in the dynamics of brain enzymes, neurons and behavior help explicate a mechanism of de-coherence in bipolar disease (Mandell et al, 1985); do these approaches to membrane conductance fluctuations suggest a new way to think about ion channel dynamics (Liebovitch, 1990); can alcohol-induced changes in statistical dynamics of the EEG predict genetic predilection in males to alcoholism (Ehlers et al, 1995); do these approaches suggest a new neural dynamical mechanism for the actions of anticonvulsant drugs (Zimmerman et al, 1991); can these measures made on non-verbal, psychomotor tasks yield a non-intrusive measure of personality and character (Selz, 1992); can these approaches to deviant patterns of psychomotor sequencing in schizophrenics give us some insight into potential (cerebeller-basal ganglia?) mechanisms of the thought disorder in schizophrenia (Paulus et al, 1994); does cocaine induce new patterns of behavior that conserve pre-treatment entropy in developing animals (Smotherman et al, 1996); will these quantities applied to objective gait observables supply early diagnoses and quantification of clinical course in patients with extra-pyramidal disorders or taking anti-psychotic medication (Hausdorff et al, 1998); can these transformations of time series on the EEG give us an early diagnostic approach to Alzheimer's disease (Jeong et al, 1998) or a new acute preventive pharmacological approach to patients with psychomotor and partial seizures (Iasemidis et al, 1990).

To end where we began: We think that if neuroscientists "did their own" nonlinear dynamical theory and analysis, shaped and tailored by intuitions growing out of their own experimental work and thinking, abstract and philosophical questions about what is determinism and what is random would retreat in favor of new specific ideas and experiments about brain dynamical mechanisms and their pathophysiology. From the studies reviewed here, it appears that a robust move in this direction in the brain sciences is well underway.

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"The 4-Hour Workweek is a new way of solving a very old problem: just how can we work to live and prevent our lives from being all about work? A world of infinite options awaits those who would read this book and be inspired by it!"

—**MICHAEL E. GERBER**, founder and chairman of E-Myth Worldwide and the world's #1 small business guru

"This is a whole new ball game. Highly recommended."

—**DR. STEWART D. FRIEDMAN**, adviser to Jack Welch and former Vice President Al Gore on work/family issues and director of the Work/Life Integration Program at the Wharton School, University of Pennsylvania

"Timothy has packed more lives into his 29 years than Steve Jobs has in his 51."

—**TOM FOREMSKI**, journalist and publisher of SiliconValleyWatcher.com

"If you want to live life on your own terms, this is your blueprint."

—**MIKE MAPLES**, cofounder of Motive Communications (IPO to $260M market cap) and founding executive of Tivoli (sold to IBM for $750M)

"Thanks to Tim Ferriss, I have more time in my life to travel, spend time with family, and write book blurbs. This is a dazzling and highly useful work."

—**A. J. JACOBS**, editor-at-large of *Esquire* magazine and author of *The Know-It-All*

"Tim is Indiana Jones for the digital age. I've already used his advice to go spearfishing on remote islands and ski the best hidden slopes of Argentina. Simply put, do what he says and you can live like a millionaire."

—**ALBERT POPE**, derivatives specialist at UBS World Headquarters

"Reading this book is like putting a few zeros on your income. Tim brings lifestyle to a new level listen to him.”

—**MICHAEL D. KERLIN**, McKinsey & Company consultant to Bush-Clinton Katrina Fund and a J. William Fulbright Scholar

“Part scientist and part adventure hunter, Tim Ferriss has created a road map for an entirely new world. I devoured this book in one sitting—I have seen nothing like it.”

—**CHARLES L. BROCK**, chairman and CEO of Brock Capital Group; former CFO, COO, and general counsel of Scholastic, Inc.; and former president of the Harvard Law School Association

“Outsourcing is no longer just for Fortune 500 companies. Small and mid-sized firms, as well as busy professionals, can outsource their work to increase their productivity and free time for more important commitments. It’s time for the world to take advantage of this revolution.”

—**VIVEK KULKARNI**, CEO of Brickwork India and former IT secretary of Bangalore; credited as the “techno-bureaucrat” who helped make Bangalore an IT destination in India

“Tim is the master! I should know. I followed his rags to riches path and watched him transform himself from competitive fighter to entrepreneur. He tears apart conventional assumptions until he finds a better way.”

—**DAN PARTLAND**, Emmy Award–winning producer of *American High* and *Welcome to the Dollhouse*

“The 4-Hour Workweek is an absolute necessity for those adventurous souls who want to live life to its fullest. Buy it and read it before you sacrifice any more!”

—**JOHN LUSK**, group product manager at Microsoft World Headquarters

“If you want to live your dreams now, and not in 20 or 30 years, buy this book!”

—**LAURA RODEN**, chairman of the Silicon Valley Association of Startup Entrepreneurs and a lecturer in Corporate Finance at San Jose State University

“With this kind of time management and focus on the important things in life, people should be able to get 15 times as much done in a normal workweek.”

—**TIM DRAPER**, founder of Draper Fisher Jurvetson, financiers to innovators including Hotmail, Skype, and Overture.com

“Tim has done what most people only dream of doing. I can’t believe he is going to let his secrets out of the bag. This book is a must read!”

—**STEPHEN KEY**, top inventor and team designer of Teddy Ruxpin and Lazer Tag and a consultant to the television show *American Inventor*

The 4-Hour Workweek

ESCAPE 9–5, LIVE ANYWHERE, AND JOIN THE NEW RICH

Expanded and Updated

TIMOTHY FERRISS

CROWN PUBLISHERS NEW YORK

For my parents,
DONALD AND FRANCES FERRISS,
who taught a little hellion that marching to a different drummer
was a good thing. I love you both and owe you everything.

SUPPORT YOUR LOCAL TEACHER—
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not-for-profits, including Donorschoose.org.

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PREFACE TO THE EXPANDED AND UPDATED EDITION

The 4-Hour Workweek was turned down by 26 out of 27 publishers.

After it was sold, the president of one potential marketing partner, a large bookseller, e-mailed me historical bestseller statistics to make it clear—this wouldn't be a mainstream success.

So I did all I knew how to do. I wrote it with two of my closest friends in mind, speaking directly to them and their problems—problems I long had—and I focused on the unusual options that had worked for me around the world.

I certainly tried to set conditions for making a sleeper hit possible, but I knew it wasn't likely. I hoped for the best and planned for the worst.

May 2, 2007, I receive a call on my cell phone from my editor.

"Tim, you hit the list."

It was just past 5 P.M. in New York City, and I was exhausted. The book had launched five days before, and I had just finished a series of more than twenty radio interviews in succession, beginning at 6 A.M. that morning. I never planned a book tour, preferring instead to "batch" radio satellite tours into 48 hours.

"Heather, I love you, but please don't $#%* with me."

"No, you really hit the list. Congratulations, Mr. *New York Times* bestselling author!"

I leaned against the wall and slid down until I was sitting on the floor. I closed my eyes, smiled, and took a deep breath. Things were about to change.

Everything was about to change.

Lifestyle Design from Dubai to Berlin

The 4-Hour Workweek has now been sold into 35 languages. It's been on the bestseller lists for more than two years, and every month brings a new story and a new discovery.

From the *Economist* to the cover of the *New York Times Style* section, from the streets of Dubai to the cafes of Berlin, lifestyle design has cut across cultures to become a worldwide movement. The original ideas of the book have been broken apart, improved, and tested in environments and ways I never could have imagined.

So why the new edition if things are working so well? Because I knew it could be better, and there was a missing ingredient: you.

This expanded and updated edition contains more than 100 pages of new content, including the latest cutting-edge technologies, field-tested resources, and—most important—real-world success stories chosen from more than 400 pages of case studies submitted by readers.

Families and students? CEOs and professional vagabonds? Take your pick. There should be someone whose results you can duplicate. Need a template to negotiate remote work, a paid year in Argentina, perhaps? This time, it's in here.

The Experiments in Lifestyle Design blog (www.fourhourblog.com) was launched alongside the book, and within six months, it became one of the top 1,000 blogs in the world, out of more than 120 million. Thousands of readers have shared their own amazing tools and tricks, producing phenomenal and unexpected results. The blog became the laboratory I'd always wanted, and I encourage you to join us there.

The new "Best of the Blog" section includes several of the most popular posts from the Experiments in Lifestyle Design blog. On the blog itself, you can also find recommendations from everyone from Warren Buffett (seriously, I tracked him down and show you how I did it) to chess prodigy Josh Waitzkin. It's an experimental playground for those who want better results in less time.

Not "Revised"

This is not a "revised" edition in the sense that the original no longer works. The typos and small mistakes have been fixed over more than 40 printings in the U.S. This is the first major overhaul, but not for the reason you'd expect.

Things have changed dramatically since April 2007. Banks are failing, retirement and pension funds are evaporating, and jobs are being lost at record rates. Readers and skeptics alike have asked: Can the principles and techniques in the book really still work in an economic recession or depression?

Yes and yes.

In fact, questions I posed during pre-crash lectures, including "How would your priorities and decisions change if you could never retire?" are no longer hypothetical. Millions of people have seen their savings portfolios fall 40% or more in value and are now looking for options C and D. Can they redistribute retirement throughout life to make it more affordable? Can they relocate a few months per year to a place like Costa Rica or Thailand to multiply the lifestyle output of their decreased savings? Sell their services to companies in the UK to earn in a stronger currency? The answer to all of them is, more than ever, yes.

The concept of lifestyle design as a replacement for multi-staged career planning is sound. It's more flexible and allows you to test different lifestyles without committing to a 10- or 20-year retirement plan that can fail due to market fluctuations outside of your control. People are open to exploring alternatives (and more forgiving of others who do the same), as many of the other options—the once "safe" options—have failed.

When everything and everyone is failing, what is the cost of a little experimentation outside of the norm? Most often, nothing. Flash forward to 2011; is a job interviewer asking about that unusual gap year?

"Everyone was getting laid off and I had a once-in-a-lifetime chance to travel around the world. It was incredible."

If anything, they'll ask you how to do the same. The scripts in this book still work.

Facebook and LinkedIn launched in the post-2000 dot-com "depression." Other recession-born babies include Monopoly, Apple, Cliff Bar, Scrabble, KFC, Domino's Pizza, FedEx, and Microsoft. This is no coincidence, as economic downturns produce discounted infrastructure, outstanding freelancers at bargain prices, and rock-bottom advertising deals—all impossible when everyone is optimistic.

Whether a yearlong sabbatical, a new business idea, reengineering your life within the corporate beast, or dreams you've postponed for "some day," there has never been a better time for testing the uncommon.

What's the worst that could happen?

I encourage you to remember this often-neglected question as you begin to see the infinite possibilities outside of your current comfort zone. This period of collective panic is your big chance to dabble.

It's been an honor to share the last two years with incredible readers around the world, and I hope you enjoy this new edition as much as I enjoyed putting it together.

I am, and will continue to be, a humble student of you all.

Un abrazo fuerte,

TIM FERRISS

San Franciso, California
April 21, 2009

First and Foremost

FAQ—DOUBTERS READ THIS

Is lifestyle design for you? Chances are good that it is. Here are some of the most common doubts and fears that people have before taking the leap and joining the New Rich:

Do I have to quit or hate my job? Do I have to be a risk-taker?

No on all three counts. From using Jedi mind tricks to disappear from the office to designing businesses that finance your lifestyle, there are paths for every comfort level. How does a Fortune 500 employee explore the hidden jewels of China for a month and use technology to cover his tracks? How do you create a hands-off business that generates $80K per month with no management? It's all here.

Do I have to be a single twenty-something?

Not at all. This book is for anyone who is sick of the deferred-life plan and wants to live life large instead of postpone it. Case studies range from a Lamborghini-driving 21-year-old to a single mother who traveled the world for five months with her two children. If you're sick of the standard menu of options and prepared to enter a world of infinite options, this book is for you.

Do I have to travel? I just want more time.

No. It's just one option. The objective is to create freedom of time and place and use both however *you* want.

Do I need to be born rich?

No. My parents have never made more than $50,000 per year combined, and I've worked since age 14. I'm no Rockefeller and you needn't be either.

Do I need to be an Ivy League graduate?

Nope. Most of the role models in this book didn't go to the Harvards of the world, and some are dropouts. Top academic institutions are wonderful, but there are unrecognized benefits to not coming out of one. Grads from top schools are funneled into high-income 80-hour-per-week jobs, and 15–30 years of soul-crushing work has been accepted as the default path. How do I know? I've been there and seen the destruction. This book reverses it.

MY STORY AND WHY YOU NEED THIS BOOK

> Whenever you find yourself on the side of the majority, it is time to pause and reflect.
>
> —MARK TWAIN

> Anyone who lives within their means suffers from a lack of imagination.
>
> —OSCAR WILDE, Irish dramatist and novelist

My hands were sweating again.

Staring down at the floor to avoid the blinding ceiling lights, I was supposedly one of the best in the world, but it just didn't register. My partner Alicia shifted from foot to foot as we stood in line with nine other couples, all chosen from over 1,000 competitors from 29 countries and four continents. It was the last day of the Tango World Championship semifinals, and this was our final run in front of the judges, television cameras, and cheering crowds. The other couples had an average of 15 years together. For us, it was the culmination of 5 months of nonstop 6-hour practices, and finally, it was showtime.

"How are you doing?" Alicia, a seasoned professional dancer, asked me in her distinctly Argentine Spanish.

"Fantastic. Awesome. Let's just enjoy the music. Forget the crowd—they're not even here."

That wasn't entirely true. It was hard to even fathom 50,000 spectators and coordinators in La Rural, even if it was the biggest exhibition hall in Buenos Aires. Through the thick haze of cigarette smoke, you could barely make out the huge undulating mass in the stands, and everywhere there was exposed floor, except the sacred 30′ **x** 40′ space in the middle of it all. I adjusted my pin-striped suit and fussed with my blue silk handkerchief until it was obvious that I was just fidgeting.

"Are you nervous?"

"I'm not nervous. I'm excited. I'm just going to have fun and let the rest follow."

"Number 152, you're up." Our chaperone had done his job, and now it was our turn. I whispered an inside joke to Alicia as we stepped on the hardwood platform: *"Tranquilo"*—Take it easy. She laughed, and at just that moment, I thought to myself, "What on earth would I be doing right now, if I hadn't left my job and the U.S. over a year ago?"

The thought vanished as quickly as it had appeared when the announcer came over the loudspeaker and the crowd erupted to match him: "Pareja numero 152, Timothy Ferriss y Alicia Monti, Ciudad de Buenos Aires!!!"

We were on, and I was beaming.

THE MOST FUNDAMENTAL of American questions is hard for me to answer these days, and luckily so. If it weren't, you wouldn't be holding this book in your hands.

"So, what do you do?"

Assuming you can find me (hard to do), and depending on when you ask me (I'd prefer you didn't), I could be racing motorcycles in Europe, scuba diving off a private island in Panama, resting under a palm tree between kickboxing sessions in Thailand, or dancing tango in Buenos Aires. The beauty is, I'm not a multimillionaire, nor do I particularly care to be.

I never enjoyed answering this cocktail question because it reflects an epidemic I was long part of: job descriptions as self-descriptions. If someone asks me now and is anything but absolutely sincere, I explain my lifestyle of mysterious means simply.

"I'm a drug dealer."

Pretty much a conversation ender. It's only half true, besides. The whole truth would take too long. How can I possibly explain that what I do with my time and what I do for money are completely different things? That I work less than four hours per week and make more per month than I used to make in a year?

For the first time, I'm going to tell you the real story. It involves a quiet subculture of people called the "New Rich."

What does an igloo-dwelling millionaire do that a cubicle dweller doesn't? Follow an uncommon set of rules.

How does a lifelong blue-chip employee escape to travel the world for a month without his boss even noticing? He uses technology to hide the fact.

Gold is getting old. The New Rich (**NR**) are those who abandon the deferred-life plan and create luxury lifestyles in the present using the currency of the New Rich: time and mobility. This is an art and a science we will refer to as Lifestyle Design (**LD**).

I've spent the last three years traveling among those who live in worlds currently beyond your imagination. Rather than hating reality, I'll show you how to bend it to your will. It's easier than it sounds. My journey from grossly overworked and severely underpaid office worker to member of the **NR** is at once stranger than fiction and—now that I've deciphered the code—simple to duplicate. There is a recipe.

Life doesn't have to be so damn hard. It really doesn't. Most people, my past self included, have spent too much time convincing themselves that life has to be hard, a resignation to 9-to-5 drudgery in exchange for (sometimes) relaxing weekends and the occasional keep-it-short-or-get-fired vacation.

The truth, at least the truth I live and will share in this book, is quite different. From leveraging currency differences to outsourcing your life and disappearing, I'll show you how a small underground uses economic sleight-of-hand to do what most consider impossible.

If you've picked up this book, chances are that you don't want to sit behind a desk until you are 62. Whether your dream is escaping the rat race, real-life fantasy travel, long-term wandering, setting world records, or simply a dramatic career change, this book will give you all the tools you need to make it a reality in the here-and-now instead of in the often elusive "retirement." There is a way to get the rewards for a life of hard work without waiting until the end.

How? It begins with a simple distinction most people miss—one I missed for 25 years.

People don't want to *be* millionaires—they want to experience what they believe only millions can buy. Ski chalets, butlers, and exotic travel often enter the picture. Perhaps rubbing cocoa butter on your belly in a hammock while you listen to waves rhythmically lapping against the deck of your thatched-roof bungalow? Sounds nice.

$1,000,000 in the bank isn't the fantasy. The fantasy is the lifestyle of complete freedom it supposedly allows. The question is then, *How can one achieve the millionaire lifestyle of complete freedom without first having $1,000,000?*

In the last five years, I have answered this question for myself, and this book will answer it for you. I will show you exactly how I have separated income from time and created my ideal lifestyle in the process, traveling the world and enjoying the best this planet has to offer. How on earth did I go from 14-hour days and $40,000 per year to 4-hour weeks and $40,000-plus per month?

It helps to know where it all started. Strangely enough, it was in a class of soon-to-be investment bankers.

In 2002, I was asked by Ed Zschau, übermentor and my former professor of High-tech Entrepreneurship at Princeton University, to come back and speak to the same class about my business adventures in the real world. I was stuck. There were already decamillionaires speaking to the same class, and even though I had built a highly profitable sports supplement company, I marched to a distinctly different drummer.

Over the ensuing days, however, I realized that everyone seemed to be discussing how to build large and successful companies, sell out, and live the good life. Fair enough. The question no one really seemed to be asking or answering was, Why do it all in the first place? What is the pot of gold that justifies spending the best years of your life hoping for happiness in the last?

The lectures I ultimately developed, titled "Drug Dealing for Fun and Profit," began with a simple premise: Test the most basic assumptions of the work-life equation.

- ► How do your decisions change if retirement isn't an option?
- ► What if you could use a mini-retirement to sample your deferred-life plan reward before working 40 years for it?
- ► Is it really necessary to work like a slave to live like a millionaire?

Little did I know where questions like these would take me.

The uncommon conclusion? The commonsense rules of the "real world" are a fragile collection of socially reinforced illusions. This book will teach you how to see and seize the options others do not.

What makes this book different?

First, I'm not going to spend much time on the problem. I'm going to assume you are suffering from time famine, creeping dread, or—worst case—a tolerable and comfortable existence doing something unfulfilling. The last is most common and most insidious.

Second, this book is not about saving and will not recommend you abandon your daily glass of red wine for a million dollars 50 years from now. I'd rather have the wine. I won't ask you to choose between enjoyment today or money later. I believe you can have both now. The goal is fun *and* profit.

Third, this book is not about finding your "dream job." I will take as a given that, for most people, somewhere between six and seven billion of them, the perfect job is the one that takes the least time. The vast majority of people will never find a job that can be an unending source of fulfillment, so that is not the goal here; to free time and automate income is.

I OPEN EACH class with an explanation of the singular importance of being a "dealmaker." The manifesto of the dealmaker is simple: Reality is negotiable. Outside of science and law, all rules can be bent or broken, and it doesn't require being unethical.

The **DEAL** of deal making is also an acronym for the process of becoming a member of the New Rich.

The steps and strategies can be used with incredible results—whether you are an employee or an entrepreneur. Can you do everything I've done with a boss? No. Can you use the same principles to double your income, cut your hours in half, or at least double the usual vacation time? Most definitely.

Here is the step-by-step process you'll use to reinvent yourself:

D for Definition turns misguided common sense upside down and introduces the rules and objectives of the new game. It replaces self-defeating assumptions and explains concepts such as relative wealth and eustress.[1] Who are the **NR** and how do they operate? This section explains the overall lifestyle design recipe—the fundamentals—before we add the three ingredients.

E for Elimination kills the obsolete notion of time management once and for all. It shows exactly how I used the words of an often-forgotten Italian economist to turn 12-hour days into two-hour days … in 48 hours. Increase your per-hour results ten times or more with counterintuitive **NR** techniques for cultivating selective ignorance, developing a low-information diet, and otherwise ignoring the unimportant. This section provides the first of the three luxury lifestyle design ingredients: time.

A **for Automation** puts cash flow on autopilot using geographic arbitrage, outsourcing, and rules of nondecision. From bracketing to the routines of ultrasuccessful **NR**, it's all here. This section provides the second ingredient of luxury lifestyle design: income.

L **for Liberation** is the mobile manifesto for the globally inclined. The concept of mini-retirements is introduced, as are the means for flawless remote control and escaping the boss. Liberation is not about cheap travel; it is about forever breaking the bonds that confine you to a single location. This section delivers the third and final ingredient for luxury lifestyle design: mobility.

I should note that most bosses are less than pleased if you spend one hour in the office each day, and employees should therefore read the steps in the entrepreneurially minded **DEAL** order but implement them as **DELA**. If you decide to remain in your current job, it is necessary to create freedom of location before you cut your work hours by 80%. Even if you have never considered becoming an entrepreneur in the modern sense, the **DEAL** process will turn you into an entrepreneur in the purer sense as first coined by French economist J. B. Say in 1800—one who shifts economic resources out of an area of lower and into an area of higher yield.

Last but not least, much of what I recommend will seem impossible and even offensive to basic common sense—I expect that. Resolve now to test the concepts as an exercise in lateral thinking. If you try it, you'll see just how deep the rabbit hole goes, and you won't ever go back.

Take a deep breath and let me show you my world. And remember—*tranquilo*. It's time to have fun and let the rest follow.

TIM FERRISS

Tokyo, Japan
September 29, 2006

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1. Uncommon terms are defined throughout this book as concepts are introduced. If something is unclear or you need a quick reference, please visit www.fourhourblog.com for an extensive glossary and other resources.

CHRONOLOGY OF A PATHOLOGY

> An expert is a person who has made all the mistakes that can be made in a very narrow field.
>
> —NIELS BOHR, Danish physicist and Nobel Prize winner

> Ordinarily he was insane, but he had lucid moments when he was merely stupid.
>
> —HEINRICH HEINE, German critic and poet

This book will teach you the precise principles I have used to become the following:

- ► Princeton University guest lecturer in high-tech entrepreneurship
- ► First American in history to hold a Guinness World Record in tango
- ► Advisor to more than 30 world-record holders in professional and Olympic sports
- ► *Wired* magazine’s “Greatest Self-Promoter of 2008”
- ► National Chinese kickboxing champion
- ► Horseback archer *(yabusame)* in Nikko, Japan
- ► Political asylum researcher and activist
- ► MTV breakdancer in Taiwan
- ► Hurling competitor in Ireland
- ► Actor on hit TV series in mainland China and Hong Kong *(Human Cargo)*

How I got to this point is a tad less glamorous:

1977 Born 6 weeks premature and given a 10% chance of living. I survive instead and grow so fat that I can’t roll onto my stomach. A muscular imbalance of the eyes makes me look in opposite directions, and my mother refers to me affectionately as “tuna fish.” So far so good.

1983 Nearly fail kindergarten because I refuse to learn the alphabet. My teacher refuses to explain why I should learn it, opting instead for “I’m the teacher—that’s why.” I tell her that’s stupid and ask her to leave me alone so I can focus on drawing sharks. She sends me to the “bad table” instead and makes me eat a bar of soap. Disdain for authority begins.

1991 My first job. Ah, the memories. I’m hired for minimum wage as the cleaner at an ice cream parlor and quickly realize that the big boss's methods duplicate effort. I do it my way, finish in one hour instead of eight, and spend the rest of the time reading kung-fu magazines and practicing karate kicks outside. I am fired in a record three days, left with the parting comment, "Maybe someday you'll understand the value of hard work." It seems I still don't.

1993 I volunteer for a one-year exchange program in Japan, where people work themselves to death—a phenomenon called *karooshi*—and are said to want to be Shinto when born, Christian when married, and Buddhist when they die. I conclude that most people are really confused about life. One evening, intending to ask my host mother to wake me the next morning *(okosu)*, I ask her to violently rape me *(okasu)*. She is very confused.

1996 I manage to slip undetected into Princeton, despite SAT scores 40% lower than the average and my high school admissions counselor telling me to be more "realistic." I conclude I'm just not good at reality. I major in neuroscience and then switch to East Asian studies to avoid putting printer jacks on cat heads.

1997 Millionaire time! I create an audiobook called *How I Beat the Ivy League*, use all my money from three summer jobs to manufacture 500 tapes, and proceed to sell exactly none. I will allow my mother to throw them out only in 2006, just nine years of denial later. Such is the joy of baseless overconfidence.

1998 After four shot-putters kick a friend's head in, I quit bouncing, the highest-paying job on campus, and develop a speed-reading seminar. I plaster campus with hundreds of god-awful neon green flyers that read, "triple your reading speed in 3 hours!" and prototypical Princeton students proceed to write "bullsh*t" on every single one. I sell 32 spots at $50 each for the 3-hour event, and $533 per hour convinces me that finding a market before designing a product is smarter than the reverse. Two months later, I'm bored to tears of speed-reading and close up shop. I hate services and need a product to ship.

Fall 1998 A huge thesis dispute and the acute fear of becoming an investment banker drive me to commit academic suicide and inform the registrar that I am quitting school until further notice. My dad is convinced that I'll never go back, and I'm convinced that my life is over. My mom thinks it's no big deal and that there is no need to be a drama queen.

Spring 1999 In three months, I accept and quit jobs as a curriculum designer at Berlitz, the world's largest publisher of foreign-language materials, and as an analyst at a three-person political asylum research firm. Naturally, I then fly to Taiwan to create a gym chain out of thin air and get shut down by Triads, Chinese mafia. I return to the U.S. defeated and decide to learn kickboxing, winning the national championship four weeks later with the ugliest and most unorthodox style ever witnessed.

Fall 2000 Confidence restored and thesis completely undone, I return to Princeton. My life does not end, and it seems the yearlong delay has worked out in my favor. Twenty-somethings now have David Koresh–like abilities. My friend sells a company for $450 million, and I decide to head west to sunny California to make my billions. Despite the hottest job market in the history of the world, I manage to go jobless until three months after graduation, when I pull out my trump card and send one start-up CEO 32 consecutive e-mails. He finally gives in and puts me in sales.

Spring 2001 TrueSAN Networks has gone from a 15-person nobody to the "number one privately held data storage company" (how is that measured?) with 150 employees (what are they all doing?). I am ordered by a newly appointed sales director to "start with A" in the phone book and dial for dollars. I ask him in the most tactful way possible why we are doing it like retards. He says, "Because I say so." Not a good start.

Fall 2001 After a year of 12-hour days, I find out that I'm the second-lowest-paid person in the company aside from the receptionist. I resort to aggressively surfing the web full-time. One afternoon, having run out of obscene video clips to forward, I investigate how hard it would be to start a sports nutrition company. Turns out that you can outsource everything from manufacturing to ad design. Two weeks and $5,000 of credit card debt later, I have my first batch in production and a live website. Good thing, too, as I'm fired exactly one week later.

2002–2003 BrainQUICKEN LLC has taken off, and I'm now making more than $40K per month instead of $40K per year. The only problem is that I hate life and now work 12-hour-plus days 7 days a week. Kinda painted myself into a corner. I take a one-week "vacation" to Florence, Italy, with my family and spend 10 hours a day in an Internet café freaking out. Sh*t balls. I begin teaching Princeton students how to build "successful" (i.e., profitable) companies.

Winter 2004 The impossible happens and I'm approached by an infomercial production company and an Israeli conglomerate (huh?) interested in buying my baby BrainQUICKEN. I simplify, eliminate, and otherwise clean house to make myself expendable. Miraculously, BQ doesn't fall apart, but both deals do. Back to Groundhog Day. Soon thereafter, both companies attempt to replicate my product and lose millions of dollars.

June 2004 I decide that, even if my company implodes, I need to escape before I go Howard Hughes. I turn everything upside down and—backpack in hand—go to JFK Airport in New York City, buying the first one-way ticket to Europe I can find. I land in London and intend to continue on to Spain for four weeks of recharging my batteries before returning to the salt mines. I start my relaxation by promptly having a nervous breakdown the first morning.

July 2004–2005 Four weeks turn into eight, and I decide to stay overseas indefinitely for a final exam in automation and experimental living, limiting e-mail to one hour each Monday morning. As soon as I remove myself as a bottleneck, profits increase 40%. What on earth do you do when you no longer have work as an excuse to be hyperactive and avoid the big questions? Be terrified and hold on to your ass with both hands, apparently.

September 2006 I return to the U.S. in an odd, Zen-like state after methodically destroying all of my assumptions about what can and cannot be done. "Drug Dealing for Fun and Profit" has evolved into a class on ideal lifestyle design. The new message is simple: I've seen the promised land, and there is good news. You can have it all.

Step I:
D is for Definition

Reality is merely an illusion,
albeit a very persistent one .

— ALBERT EINSTEIN

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Cautions and Comparisons

► HOW TO BURN $1,000,000 A NIGHT

These individuals have riches just as we say that we "have a fever," when really the fever has us.

— SENECA (4 B.C.–A.D. 65)

I also have in mind that seemingly wealthy, but most terribly impoverished class of all, who have accumulated dross, but know not how to use it, or get rid of it, and thus have forged their own golden or silver fetters.

— HENRY DAVID THOREAU (1817–1862)

1:00 A.M. CST / 30,000 FEET OVER LAS VEGAS

His friends, drunk to the point of speaking in tongues, were asleep. It was just the two of us now in first-class. He extended his hand to introduce himself, and an enormous—Looney Tunes enormous—diamond ring appeared from the ether as his fingers crossed under my reading light.

Mark was a legitimate magnate. He had, at different times, run practically all the gas stations, convenience stores, and gambling in South Carolina. He confessed with a half smile that, in an average trip to Sin City, he and his fellow weekend warriors might lose an average of $500,000 to $1,000,000—each. Nice.

He sat up in his seat as the conversation drifted to my travels, but I was more interested in his astounding record of printing money.

"So, of all your businesses, which did you like the most?"

The answer took less than a second of thought.

"None of them."

He explained that he had spent more than 30 years with people he didn't like to buy things he didn't need. Life had become a succession of trophy wives—he was on lucky number three—expensive cars, and other empty bragging rights. Mark was one of the living dead.

This is exactly where we don't want to end up.

Apples and Oranges: A Comparison

So, what makes the difference? What separates the New Rich, characterized by options, from the Deferrers (**D**), those who save it all for the end only to find that life has passed them by?

It begins at the beginning. The New Rich can be separated from the crowd based on their goals, which reflect very distinct priorities and life philosophies.

Note how subtle differences in wording completely change the necessary actions for fulfilling what at a glance appear to be similar goals. These are not limited to business owners. Even the first, as I will show later, applies to employees.

D: To work for yourself.
NR: To have others work for you.

D: To work when you want to.
NR: To prevent work for work's sake, and to do the minimum necessary for maximum effect ("minimum effective load").

D: To retire early or young.
NR: To distribute recovery periods and adventures (mini-retirements) throughout life on a regular basis and recognize that inactivity is not the goal. Doing that which excites you is.

D: To buy all the things you want to have.
NR: To do all the things you want to do, and be all the things you want to be. If this includes some tools and gadgets, so be it, but they are either means to an end or bonuses, not the focus.

D: To be the boss instead of the employee; to be in charge.
NR: To be neither the boss nor the employee, but the owner. To own the trains and have someone else ensure they run on time.

D: To make a ton of money.
NR: To make a ton of money with specific reasons and defined dreams to chase, timelines and steps included. What are you working for?

D: To have more.
NR: To have more quality and less clutter. To have huge financial reserves but recognize that most material wants are justifications for spending time on the things that don't really matter, including buying things and preparing to buy things. You spent two weeks negotiating your new Infiniti with the dealership and got $10,000 off? That's great. Does your life have a purpose? Are you contributing anything useful to this world, or just shuffling papers, banging on a keyboard, and coming home to a drunken existence on the weekends?

D: To reach the big pay-off, whether IPO, acquisition, retirement, or other pot of gold.
NR: To think big but ensure payday comes every day: cash flow first, big payday second.

D: To have freedom from doing that which you dislike.

NR: To have freedom from doing that which you dislike, but also the freedom and resolve to pursue your dreams without reverting to work for work's sake (W4W). After years of repetitive work, you will often need to dig hard to find your passions, redefine your dreams, and revive hobbies that you let atrophy to near extinction. The goal is not to simply eliminate the bad, which does nothing more than leave you with a vacuum, but to pursue and experience the best in the world.

Getting Off the Wrong Train

> The first principle is that you must not fool yourself, and you are the easiest person to fool.
> —RICHARD P. FEYNMAN, Nobel Prize–winning physicist

Enough is enough. Lemmings no more. The blind quest for cash is a fool's errand.

I've chartered private planes over the Andes, enjoyed many of the best wines in the world in between world-class ski runs, and lived like a king, lounging by the infinity pool of a private villa. Here's the little secret I rarely tell: It all cost less than rent in the U.S. If you can free your time and location, your money is automatically worth 3–10 times as much.

This has nothing to do with currency rates. Being financially rich and having the ability to live like a millionaire are fundamentally two very different things.

Money is multiplied in practical value depending on the number of W's you control in your life: **what** you do, **when** you do it, **where** you do it, and with **whom** you do it. I call this the "freedom multiplier."

Using this as our criterion, the 80-hour-per-week, $500,000-per-year investment banker is less "powerful" than the employed **NR** who works ¼ the hours for $40,000, but has complete freedom of when, where, and how to live. The former's $500,000 may be worth less than $40,000 and the latter's $40,000 worth more than $500,000 when we run the numbers and look at the lifestyle output of their money.

Options—the ability to choose—is real power. This book is all about how to see and create those options with the least effort and cost. It just so happens, paradoxically, that you can make more money—a lot more money—by doing half of what you are doing now.

So, Who Are the NR?

- ► The employee who rearranges his schedule and negotiates a remote work agreement to achieve 90% of the results in one-tenth of the time, which frees him to practice cross-country skiing and take road trips with his family two weeks per month.

- The business owner who eliminates the least profitable customers and projects, outsources all operations entirely, and travels the world collecting rare documents, all while working remotely on a website to showcase her own illustration work.

- The student who elects to risk it all—which is nothing—to establish an online video rental service that delivers $5,000 per month in income from a small niche of Blu-ray aficionados, a two-hour-per-week side project that allows him to work full-time as an animal rights lobbyist.

The options are limitless, but each path begins with the same first step: replacing assumptions.

To join the movement, you will need to learn a new lexicon and recalibrate direction using a compass for an unusual world. From inverting responsibility to jettisoning the entire concept of "success," we need to change the rules.

New Players for a New Game: Global and Unrestricted

TURIN, ITALY

Civilization had too many rules for me, so I did my best to rewrite them.

—BILL COSBY

As he rotated 360 degrees through the air, the deafening noise turned to silence. Dale Begg-Smith executed the backflip perfectly—skis crossed in an X over his head—and landed in the record books as he slid across the finish.

It was February 16, 2006, and he was now a mogul-skiing gold medalist at the Turin Winter Olympics. Unlike other full-time athletes, he will never have to return to a dead-end job after his moment of glory, nor will he look back at this day as the climax of his only passion. After all, he was only 21 years old and drove a black Lamborghini.

Born a Canadian and something of a late bloomer, Dale found his calling, an Internet-based IT company, at the age of 13. Fortunately, he had a more-experienced mentor and partner to guide him: his 15-year-old brother, Jason. Created to fund their dreams of standing atop the Olympic podium, it would, only two years later, become the third-largest company of its kind in the world.

While Dale's teammates were hitting the slopes for extra sessions, he was often buying sake for clients in Tokyo. In a world of "work harder, not smarter," it came to pass that his coaches felt he was spending too much time on his business and not enough time in training, despite his results.

Rather than choose between his business or his dream, Dale chose to move laterally with both, from either/or to both/and. He wasn't spending too much time on his business; he and his brother were spending too much time with Canucks.

In 2002, they moved to the ski capital of the world, Australia, where the team was smaller, more flexible, and coached by a legend. Three short years later, he received citizenship, went head-to-head against former teammates, and became the third "Aussie" in history to win winter gold.

In the land of wallabies and big surf, Dale has since gone postal. Literally. Right next to the Elvis Presley commemorative edition, you can buy stamps with his face on them.

Fame has its perks, as does looking outside the choices presented to you. There are always lateral options.

NEW CALEDOINA, SOUTH PACIFIC OCEAN

> Once you say you're going to settle for second, that's what happens to you in life.
>
> —JOHN F. KENNEDY

Some people remain convinced that just a bit more money will make things right. Their goals are arbitrary moving targets: $300,000 in the bank, $1,000,000 in the portfolio, $100,000 a year instead of $50,000, etc. Julie's goal made intrinsic sense: come back with the same number of children she had left with.

She reclined in her seat and glanced across the aisle past her sleeping husband, Marc, counting as she had done thousands of times—one, two, three. So far so good. In 12 hours, they would all be back in Paris, safe and sound. That was assuming the plane from New Caledonia held together, of course.

New Caledonia?

Nestled in the tropics of the Coral Sea, New Caledonia was a French territory and where Julie and Marc had just sold the sailboat that took them 15,000 miles around the world. Of course, recouping their initial investment had been part of the plan. All said and done, their 15-month exploration of the globe, from the gondola-rich waterways of Venice to the tribal shores of Polynesia, had cost between $18,000 and $19,000. Less than rent and baguettes in Paris.

Most people would consider this impossible. Then again, most people don't know that more than 300 families set sail from France each year to do the same.

The trip had been a dream for almost two decades, relegated to the back of the line behind an ever-growing list of responsibilities. Each passing moment brought a new list of reasons for putting it off. One day, Julie realized that if she didn't do it now, she would never do it. The rationalizations, legitimate or not, would just continue to add up and make it harder to convince herself that escape was possible.

One year of preparation and one 30-day trial run with her husband later, they set sail on the trip of a lifetime. Julie realized almost as soon as the anchor lifted that, far from being a reason not to travel and seek adventure, children are perhaps the best reason of all to do both.

Pre-trip, her three little boys had fought like banshees at the drop of a hat. In the process of learning to coexist in a floating bedroom, they learned patience, as much for themselves as for the sanity of their parents. Pre-trip, books were about as appealing as eating sand. Given the alternative of staring at a wall on the open sea, all three learned to love books. Pulling them out of school for one academic year and exposing them to new environments had proven to be the best investment in their education to date.

Now sitting in the plane, Julie looked out at the clouds as the wing cut past them, already thinking of their next plans: to find a place in the mountains and ski all year long, using income from a sail-rigging workshop to fund the slopes and more travel.

Now that she had done it once, she had the itch.

► LIFESTYLE DESIGN IN ACTION

I was done with driving across town to collect my son from child- care only to slide across icy highways trying to get back to work with him in tow to finish my work. My mini-retirement brought us both to live at an alternative boarding school full of creative lifestyle redesigning children and staff in a gorgeous Florida forest with a spring-fed pond and plenty of sunshine. You can easily search for alternative schools or traditional schools that might accept your children during your stay. Alternative schools often see themselves as supportive communities and are exceptionally welcoming. You might even find an opportunity to work at a school where you could experience a new environment with your child.

—DEB

• • •

Tim,

Your book and blog have inspired me to quit my job, write two e-books, sky dive, backpack through South America, sell all the clutter in my life, and host an annual convention of the world's top dating instructors (my primary business venture, third year running). The best part? I can't even buy a drink yet.

Thank you so much, bro!

—ANTHONY

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Rules That Change the Rules

► EVERYTHING POPULAR IS WRONG

> I can't give you a surefire formula for success, but I can give you a formula for failure: try to please everybody all the time.
>
> —HERBERT BAYARD SWOPE, American editor and journalist; first recipient of the Pulitzer Prize

Everything popular is wrong.

—OSCAR WILDE, *The Importance of Being Earnest*

Beating the Game, Not Playing the Game

In 1999, sometime after quitting my second unfulfilling job and eating peanut-butter sandwiches for comfort, I won the gold medal at the Chinese Kickboxing (Sanshou) National Championships.

It wasn't because I was good at punching and kicking. God forbid. That seemed a bit dangerous, considering I did it on a dare and had four weeks of preparation. Besides, I have a watermelon head—it's a big target.

I won by reading the rules and looking for unexploited opportunities, of which there were two:

1. **Weigh-ins were the day prior to competition:** Using dehydration techniques commonly practiced by elite powerlifters and Olympic wrestlers, I lost 28 pounds in 18 hours, weighed in at 165 pounds, and then hyperhydrated back to 193 pounds.[2] It's hard to fight someone from three weight classes above you. Poor little guys.
2. **There was a technicality in the fine print:** If one combatant fell off the elevated platform three times in a single round, his opponent won by default. I decided to use this technicality as my principal technique and push people off. As you might imagine, this did not make the judges the happiest Chinese I've ever seen.

The result? I won all of my matches by technical knock-out (TKO) and went home national champion, something 99% of those with 5–10 years of experience had been unable to do.

But, isn't pushing people out of the ring pushing the boundaries of ethics? Not at all—it's no more than doing the uncommon within the rules. The important distinction is that between official rules and self-imposed rules. Consider the following example, from the official website of the Olympic movement (www.olympic.org).

> The 1968 Mexico City Olympics marked the international debut of Dick Fosbury and his celebrated "Fosbury flop," which would soon revolutionize high-jumping. At the time, jumpers… swung their outside foot up and over the bar [called the "straddle," much like a hurdle jump, it allowed you to land on your feet]. Fosbury's technique began by racing up to the bar at great speed and taking off from his right (or outside) foot. Then he twisted his body so that he went over the bar head-first with his back to the bar. While the coaches of the world shook their heads in disbelief, the Mexico City audience was absolutely captivated by Fosbury and shouted, "Olé!" as he cleared the bar. Fosbury cleared every height through 2.22 metres without a miss and then achieved a personal record of 2.24 metres to win the gold medal.
>
> By 1980, 13 of the 16 Olympic finalists were using the Fosbury flop.

The weight-cutting techniques and off-platform throwing I used are now standard features of Sanshou competition. I didn't cause it, I just foresaw it as inevitable, as did others who tested this superior approach. Now it's par for the course.

Sports evolve when sacred cows are killed, when basic assumptions are tested.

The same is true in life and in lifestyles.

Challenging the Status Quo vs. Being Stupid

Most people walk down the street on their legs. Does that mean I walk down the street on my hands? Do I wear my underwear outside of my pants in the name of being different? Not usually, no. Then again, walking on my legs and keeping my thong on the inside have worked just fine thus far. I don't fix it if it isn't broken.

Different is better when it is more effective or more fun.

If everyone is defining a problem or solving it one way and the results are subpar, this is the time to ask, What if I did the opposite? Don't follow a model that doesn't work. If the recipe sucks, it doesn't matter how good a cook you are.

When I was in data storage sales, my first gig out of college, I realized that most cold calls didn't get to the intended person for one reason: gatekeepers. If I simply made all my calls from 8:00–8:30 A.M. and 6:00–6:30 P.M., for a total of one hour, I was able to avoid secretaries and book more than twice as many meetings as the senior sales executives who called from 9–5. In other words, I got twice the results for 1/8 the time.

From Japan to Monaco, from globetrotting single mothers to multimillionaire racecar drivers, the basic rules of successful **NR** are surprisingly uniform and predictably divergent from what the rest of the world is doing.

The following rules are the fundamental differentiators to keep in mind throughout this book.

1. Retirement Is Worst-Case-Scenario Insurance.

Retirement planning is like life insurance. It should be viewed as nothing more than a hedge against the absolute worst-case scenario: in this case, becoming physically incapable of working and needing a reservoir of capital to survive.

Retirement as a goal or final redemption is flawed for at least three solid reasons:

1. It is predicated on the assumption that you dislike what you are doing during the most physically capable years of your life. This is a nonstarter—nothing can justify that sacrifice.
2. Most people will never be able to retire and maintain even a hotdogs-for-dinner standard of living. Even one million is chump change in a world where traditional retirement could span 30 years and inflation lowers your purchasing power 2–4% per year. The math doesn't work.[3] The golden years become lower-middle-class life revisited. That's a bittersweet ending.
3. If the math does work, it means that you are one ambitious, hardworking machine. If that's the case, guess what? One week into retirement, you'll be so damn bored that you'll want to stick bicycle spokes in your eyes. You'll probably opt to look for a new job or start another company. Kinda defeats the purpose of waiting, doesn't it?

I'm not saying don't plan for the worst case—I have maxed out 401(k)s and IRAs I use primarily for tax purposes—but don't mistake retirement for the goal.

2. Interest and Energy Are Cyclical.

course not—you couldn't. It is unsustainable, just as what most define as a career: doing the same thing for 8+ hours per day until you break down or have enough cash to permanently stop.

How else can my 30-year-old friends all look like a cross between Donald Trump and Joan Rivers? It's horrendous—premature aging fueled by triple bypass frappuccinos and impossible workloads.

Alternating periods of activity and rest is necessary to survive, let alone thrive. Capacity, interest, and mental endurance all wax and wane. Plan accordingly.

The **NR** aims to distribute "mini-retirements" throughout life instead of hoarding the recovery and enjoyment for the fool's gold of retirement. By working only when you are most effective, life is both more productive and more enjoyable. It's the perfect example of having your cake and eating it, too.

Personally, I now aim for one month of overseas relocation or high-intensity learning (tango, fighting, whatever) for every two months of work projects.

3. Less Is Not Laziness.

Doing less meaningless work, so that you can focus on things of greater personal importance, is NOT laziness. This is hard for most to accept, because our culture tends to reward personal sacrifice instead of personal productivity.

Few people choose to (or are able to) measure the results of their actions and thus measure their contribution in time. More time equals more self-worth and more reinforcement from those above and around them. The **NR**, despite fewer hours in the office, produce more meaningful results than the next dozen non-**NR** combined.

Let's define "laziness" anew—to endure a non-ideal existence, to let circumstance or others decide life for you, or to amass a fortune while passing through life like a spectator from an office window. The size of your bank account doesn't change this, nor does the number of hours you log in handling unimportant e-mail or minutiae.

Focus on being productive instead of busy.

4. The Timing Is Never Right.

I once asked my mom how she decided when to have her first child, little ol' me. The answer was simple: "It was something we wanted, and we decided there was no point in putting it off. The timing is never right to have a baby." And so it is.

For all of the most important things, the timing always sucks. Waiting for a good time to quit your job? The stars will never align and the traffic lights of life will never all be green at the same time. The universe doesn't conspire against you, but it doesn't go out of its way to line up all the pins either. Conditions are never perfect. "Someday" is a disease that will take your dreams to the grave with you. Pro and con lists are just as bad. If it's important to you and you want to do it "eventually," just do it and correct course along the way.

5. Ask for Forgiveness, Not Permission.

If it isn't going to devastate those around you, try it and then justify it. People—whether parents, partners, or bosses—deny things on an emotional basis that they can learn to accept after the fact. If the potential damage is moderate or in any way reversible, don't give people the chance to say no. Most people are fast to stop you before you get started but hesitant to get in the way if you're moving. Get good at being a troublemaker and saying sorry when you really screw up.

6. Emphasize Strengths, Don't Fix Weaknesses.

Most people are good at a handful of things and utterly miserable at most. I am great at product creation and marketing but terrible at most of the things that follow.

My body is designed to lift heavy objects and throw them, and that's it. I ignored this for a long time. I tried swimming and looked like a drowning monkey. I tried basketball and looked like a caveman. Then I became a fighter and took off.

It is far more lucrative and fun to leverage your strengths instead of attempting to fix all the chinks in your armor. The choice is between *multiplication* of results using strengths or *incremental* improvement fixing weaknesses that will, at best, become mediocre. Focus on better use of your best weapons instead of constant repair.

7. Things in Excess Become Their Opposite.

It is possible to have too much of a good thing. In excess, most endeavors and possessions take on the characteristics of their opposite. Thus:

> Pacifists become militants.
> Freedom fighters become tyrants.
> Blessings become curses.
> Help becomes hindrance. More becomes less.[4]

Too much, too many, and too often of what you want becomes what you don't want. This is true of possessions and even time. Lifestyle Design is thus not interested in creating an excess of idle time, which is poisonous, but the positive use of free time, defined simply as doing what you want as opposed to what you feel obligated to do.

8. Money Alone Is Not the Solution.

There is much to be said for the power of money as currency (I'm a fan myself), but adding more of it just isn't the answer as often as we'd like to think. In part, it's laziness. "If only I had more money" is the easiest way to postpone the intense self-examination and decision-making necessary to create a life of enjoyment—now and not later. By using money as the scapegoat and work as our all-consuming routine, we are able to conveniently disallow ourselves the time to do otherwise: "John, I'd love to talk about the gaping void I feel in my life, the hopelessness that hits me like a punch in the eye every time I start my computer in the morning, but I have so much work to do! I've got at least three hours of unimportant e-mail to reply to before calling the prospects who said 'no' yesterday. Gotta run!"

Busy yourself with the routine of the money wheel, pretend it's the fix-all, and you artfully create a constant distraction that prevents you from seeing just how pointless it is. Deep down, you know it's all an illusion, but with everyone participating in the same game of make-believe, it's easy to forget.

The problem is more than money.

9. Relative Income Is More Important Than Absolute Income.

Among dietitians and nutritionists, there is some debate over the value of a calorie. Is a calorie a calorie, much like a rose is a rose? Is fat loss as simple as expending more calories than you consume, or is the source of those calories important? Based on work with top athletes, I know the answer to be the latter.

What about income? Is a dollar is a dollar is a dollar? The New Rich don't think so.

Let's look at this like a fifth-grade math problem. Two hardworking chaps are headed toward each other. Chap A moving at 80 hours per week and Chap B moving at 10 hours per week. They both make $50,000 per year. Who will be richer when they pass in the middle of the night? If you said B, you would be correct, and this is the difference between **absolute** and **relative** income.

Absolute income is measured using one holy and inalterable variable: the raw and almighty dollar. Jane Doe makes $100,000 per year and is thus twice as rich as John Doe, who makes $50,000 per year.

Relative income uses two variables: the dollar and time, usually hours. The whole "per year" concept is arbitrary and makes it easy to trick yourself. Let's look at the real trade. Jane Doe makes $100,000 per year, $2,000 for each of 50 weeks per year, and works 80 hours per week. Jane Doe thus makes $25 per hour. John Doe makes $50,000 per year, $1,000 for each of 50 weeks per year, but works 10 hours per week and hence makes $100 per hour. In relative income, John is *four times* richer.

Of course, relative income has to add up to the minimum amount necessary to actualize your goals. If I make $100 per hour but only work one hour per week, it's going to be hard for me to run amuck like a superstar. Assuming that the total absolute income is where it needs to be to live my dreams (not an arbitrary point of comparison with the Joneses), relative income is the real measurement of wealth for the New Rich.

The top New Rich mavericks make at least $5,000 per hour. Out of college, I started at about $5. I'll get you closer to the former.

10. Distress Is Bad, Eustress Is Good.

Unbeknownst to most fun-loving bipeds, not all stress is bad. Indeed, the New Rich don't aim to eliminate all stress. Not in the least. There are two separate types of stress, each as different as euphoria and its seldom-mentioned opposite, *dys*phoria.

*Dis*tress refers to harmful stimuli that make you weaker, less confident, and less able. Destructive criticism, abusive bosses, and smashing your face on a curb are examples of this. These are things we want to avoid.

*Eu*stress, on the other hand, is a word most of you have probably never heard. *Eu-*, a Greek prefix for "healthy," is used in the same sense in the word "euphoria." Role models who push us to exceed our limits, physical training that removes our spare tires, and risks that expand our sphere of comfortable action are all examples of eustress—stress that is healthful and the stimulus for growth.

People who avoid all criticism fail. It's destructive criticism we need to avoid, not criticism in all forms. Similarly, there is no progress without eustress, and the more eustress we can create or apply to our lives, the sooner we can actualize our dreams. The trick is telling the two apart.

The New Rich are equally aggressive in removing distress and finding eustress.

► Q&A: QUESTIONS AND ACTIONS

1. How has being "realistic" or "responsible" kept you from the life you want?
2. How has doing what you "should" resulted in subpar experiences or regret for not having done something else?
3. Look at what you're currently doing and ask yourself, "What would happen if I did the opposite of the people around me? What will I sacrifice if I continue on this track for 5, 10, or 20 years?"

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[2]. Most people will assume this type of weight manipulation is impossible, so I've provided sample photographs at www.fourhourblog.com. Do NOT try this at home. I did it all under medical

supervision.

3. “Living Well” *(Barron’s*, March 20, 2006, Suzanne McGee).

4. Goldian VandenBroeck, ed. From *Less Is More: An Anthology of Ancient and Modern Voices Raised in Praise of Simplicity* (Inner Traditions, 1996).

❸

Dodging Bullets

► FEAR-SETTING AND ESCAPING PARALYSIS

> Many a false step was made by standing still.
>
> —FORTUNE COOKIE

> Named must your fear be before banish it you can.
>
> —YODA, from *Star Wars: The Empire Strikes Back*

RIO DE JANEIRO, BRAZIL

Twenty feet and closing.

“Run! Ruuuuuuuuuun!” Hans didn’t speak Portuguese, but the meaning was clear enough—haul ass. His sneakers gripped firmly on the jagged rock, and he drove his chest forward toward 3,000 feet of nothing.

He held his breath on the final step, and the panic drove him to near unconsciousness. His vision blurred at the edges, closing to a single pinpoint of light, and then … he floated. The all-consuming celestial blue of the horizon hit his visual field an instant after he realized that the thermal updraft had caught him and the wings of the paraglider. Fear was behind him on the mountaintop, and thousands of feet above the resplendent green rain forest and pristine white beaches of Copacabana, Hans Keeling had seen the light.

That was Sunday.

On Monday, Hans returned to his law office in Century City, Los Angeles’s posh corporate haven, and promptly handed in his three-week notice. For nearly five years, he had faced his alarm clock with the same dread: I have to do *this* for another 40–45 years? He had once slept under his desk at the office after a punishing half-done project, only to wake up and continue on it the next morning. That same morning, he had made himself a promise: two more times and I’m out of here. Strike number three came the day before he left for his Brazilian vacation.

We all make these promises to ourselves, and Hans had done it before as well, but things were now somehow different. He was different. He had realized something while arcing in slow circles toward the earth—risks weren't that scary once you took them. His colleagues told him what he expected to hear: He was throwing it all away. He was an attorney on his way to the top—what the hell did he want?

Hans didn't know exactly what he wanted, but he had tasted it. On the other hand, he did know what bored him to tears, and he was done with it. No more passing days as the living dead, no more dinners where his colleagues compared cars, riding on the sugar high of a new BMW purchase until someone bought a more expensive Mercedes. It was over.

Immediately, a strange shift began—Hans felt, for the first time in a long time, at peace with himself and what he was doing. He had always been terrified of plane turbulence, as if he might die with the best inside of him, but now he could fly through a violent storm sleeping like a baby. Strange indeed.

More than a year later, he was still getting unsolicited job offers from law firms, but by then had started Nexus Surf,[5] a premier surf-adventure company based in the tropical paradise of Florianopolis, Brazil. He had met his dream girl, a Carioca with caramel-colored skin named Tatiana, and spent most of his time relaxing under palm trees or treating clients to the best times of their lives.

Is this what he had been so afraid of?

These days, he often sees his former self in the underjoyed and overworked professionals he takes out on the waves. Waiting for the swell, the true emotions come out: "God, I wish I could do what you do." His reply is always the same: "You can."

The setting sun reflects off the surface of the water, providing a Zen-like setting for a message he knows is true: It's not giving up to put your current path on indefinite pause. He could pick up his law career exactly where he left off if he wanted to, but that is the furthest thing from his mind.

As they paddle back to shore after an awesome session, his clients get ahold of themselves and regain their composure. They set foot on shore, and reality sinks its fangs in: "I would, but I can't really throw it all away."

He has to laugh.

The Power of Pessimism: Defining the Nightmare

> Action may not always bring happiness, but there is no happiness without action.
>
> —BENJAMIN DISRAELI, former British Prime Minister

To door not to do? To try or not to try? Most people will vote no, whether they consider themselves brave or not. Uncertainty and the prospect of failure can be very scary noises in the shadows. Most people will choose unhappiness over uncertainty. For years, I set goals, made resolutions to change direction, and nothing came of either. I was just as insecure and scared as the rest of the world.

The simple solution came to me accidentally four years ago. At that time, I had more money than I knew what to do with—I was making $70K or so per month—and I was completely miserable, worse than ever. I had no time and was working myself to death. I had started my own company, only to realize it would be nearly impossible to sell.[6]Oops. I felt trapped and stupid at the same time. I should be able to figure this out, I thought. Why am I such an idiot? Why can't I make this work?! Buckle up and stop being such a (insert expletive)! What's wrong with me? The truth was, nothing was wrong with me. I hadn't reached my limit; I'd reached the limit of my business model at the time. It wasn't the driver, it was the vehicle.

brain to a supercomputer—it didn't matter. My little baby had some serious birth defects. The question then became, How do I free myself from this Frankenstein while making it self-sustaining? How do I pry myself from the tentacles of workaholism and the fear that it would fall to pieces without my 15-hour days? How do I escape this self-made prison? A trip, I decided. A sabbatical year around the world.

So I took the trip, right? Well, I'll get to that. First, I felt it prudent to dance around with my shame, embarrassment, and anger for six months, all the while playing an endless loop of reasons why my cop-out fantasy trip could never work. One of my more productive periods, for sure.

Then, one day, in my bliss of envisioning how bad my future suffering would be, I hit upon a gem of an idea. It was surely a highlight of my "don't happy, be worry" phase: Why don't I decide exactly what my nightmare would be—the worst thing that could possibly happen as a result of my trip?

Well, my business could fail while I'm overseas, for sure. Probably would. A legal warning letter would accidentally not get forwarded and I would get sued. My business would be shut down, and inventory would spoil on the shelves while I'm picking my toes in solitary misery on some cold shore in Ireland. Crying in the rain, I imagine. My bank account would crater by 80% and certainly my car and motorcycle in storage would be stolen. I suppose someone would probably spit on my head from a high-rise balcony while I'm feeding food scraps to a stray dog, which would then spook and bite me squarely on the face. God, life is a cruel, hard bitch.

Conquering Fear = Defining Fear

> Set aside a certain number of days, during which you shall be content with the scantiest and cheapest fare, with course and rough dress, saying to yourself the while: "Is this the condition that I feared?"
>
> —SENECA

Then a funny thing happened. In my undying quest to make myself miserable, I accidentally began to backpedal. As soon as I cut through the vague unease and ambiguous anxiety by defining my nightmare, the worst-case scenario, I wasn't as worried about taking a trip. Suddenly, I started thinking of simple steps I could take to salvage my remaining resources and get back on track if all hell struck at once. I could always take a temporary bartending job to pay the rent if I had to. I could sell some furniture and cut back on eating out. I could steal lunch money from the kindergarteners who passed by my apartment every morning. The options were many. I realized it wouldn't be that hard to get back to where I was, let alone survive. None of these things would be fatal—not even close. Mere panty pinches on the journey of life.

I realized that on a scale of 1–10, 1 being nothing and 10 being permanently life-changing, my so-called worst-case scenario might have a *temporary* impact of 3 or 4. I believe this is true of most people and most would-be "holy sh*t, my life is over" disasters. Keep in mind that this is the one-in-a-million disaster nightmare. On the other hand, if I realized my best-case scenario, or even a probable-case scenario, it would easily have a *permanent* 9 or 10 positive life-changing effect.

In other words, I was risking an unlikely and temporary 3 or 4 for a probable and permanent 9 or 10, and I could easily recover my baseline workaholic prison with a bit of extra work if I wanted to. This all equated to a significant realization: There was practically no risk, only huge life-changing upside potential, and I could resume my previous course without any more effort than I was already putting forth.

That is when I made the decision to take the trip and bought a one-way ticket to Europe. I started planning my adventures and eliminating my physical and psychological baggage. None of my disasters came to pass, and my life has been a near fairy tale since. The business did better than ever, and I practically forgot about it as it financed my travels around the world in style for 15 months.

Uncovering Fear Disguised as Optimism

> There's no difference between a pessimist who says, "Oh, it's hopeless, so don't bother doing anything," and an optimist who says, "Don't bother doing anything, it's going to turn out fine anyway." Either way, nothing happens.
>
> —YVON CHOUINARD,[7] founder of Patagonia

Fear comes in many forms, and we usually don't call it by its four-letter name. Fear itself is quite fear-inducing. Most intelligent people in the world dress it up as something else: optimistic denial. Most who avoid quitting their jobs entertain the thought that their course will improve with time or increases in income. This seems valid and is a tempting hallucination when a job is boring or uninspiring instead of pure hell. Pure hell forces action, but anything less can be endured with enough clever rationalization.

Do you really think it will improve or is it wishful thinking and an excuse for inaction? If you were confident in improvement, would you really be questioning things so? Generally not. This is fear of the unknown disguised as optimism.

Are you better off than you were one year ago, one month ago, or one week ago?

If not, things will not improve by themselves. If you are kidding yourself, it is time to stop and plan for a jump. Barring any James Dean ending, your life is going to be LONG. Nine to five for your working lifetime of 40–50 years is a long-ass time if the rescue doesn't come. About 500 months of solid work.

How many do you have to go? It's probably time to cut your losses.

Someone Call the Maître D'

> You have comfort. You don't have luxury. And don't tell me that money plays a part. The luxury I advocate has nothing to do with money. It cannot be bought. It is the reward of those who have no fear of discomfort.
>
> —JEAN COCTEAU, French poet, novelist, boxing manager, and filmmaker, whose collaborations were the inspiration for the term "surrealism"

Sometimes timing is perfect. There are hundreds of cars circling a parking lot, and someone pulls out of a spot 10 feet from the entrance just as you reach his or her bumper. Another Christmas miracle!

Other times, the timing could be better. The phone rings during sex and seems to ring for a half hour. The UPS guy shows up 10 minutes later. Bad timing can spoil the fun.

Jean-Marc Hachey landed in West Africa as a volunteer, with high hopes of lending a helping hand. In that sense, his timing was great. He arrived in Ghana in the early 1980s, in the middle of a coup d'état, at the peak of hyperinflation, and just in time for the worst drought in a decade. For these same reasons, some people would consider his timing quite poor from a more selfish survival standpoint.

He had also missed the memo. The national menu had changed, and they were out of luxuries like bread and clean water. He would be surviving for four months on a slushlike concoction of corn meal and spinach. Not what most of us would order at the movie theater.

“WOW, I CAN SURVIVE.”

Jean-Marc had passed the point of no return, but it didn’t matter. After two weeks of adjusting to the breakfast, lunch, and dinner (Mush à la Ghana), he had no desire to escape. The most basic of foods and good friends proved to be the only real necessities, and what would seem like a disaster from the outside was the most life-affirming epiphany he’d ever experienced: The worst really wasn’t that bad. To enjoy life, you don’t need fancy nonsense, but you do need to control your time and realize that most things just aren’t as serious as you make them out to be.

Now 48, Jean-Marc lives in a nice home in Ontario, but could live without it. He has cash, but could fall into poverty tomorrow and it wouldn’t matter. Some of his fondest memories still include nothing but friends and gruel. He is dedicated to creating special moments for himself and his family and is utterly unconcerned with retirement. He’s already lived 20 years of partial retirement in perfect health.

Don’t save it all for the end. There is every reason not to.

► Q&A: QUESTIONS AND ACTIONS

> I am an old man and have known a great many troubles, but most of them never happened.
>
> —MARK TWAIN

If you are nervous about making the jump or simply putting it off out of fear of the unknown, here is your antidote. Write down your answers, and keep in mind that thinking a lot will not prove as fruitful or as prolific as simply brain vomiting on the page. Write and do not edit—aim for volume. Spend a few minutes on each answer.

1. **Define your nightmare, the absolute worst that could happen if you did what you are considering**. What doubt, fears, and “what-ifs” pop up as you consider the big changes you can—or need—to make? Envision them in painstaking detail. Would it be the end of your life? What would be the permanent impact, if any, on a scale of 1–10? Are these things really permanent? How likely do you think it is that they would actually happen?
2. **What steps could you take to repair the damage or get things back on the upswing, even if temporarily?** Chances are, it’s easier than you imagine. How could you get things back under control?
3. **What are the outcomes or benefits, both temporary and permanent, of more probable scenarios?** Now that you’ve defined the nightmare, what are the more probable or definite positive outcomes, whether internal (confidence, self-esteem, etc.) or external? What would the impact of these more-likely outcomes be on a scale of 1–10? How likely is it that you could produce at least a moderately good outcome? Have less intelligent people done this before and pulled it off?

4. **If you were fired from your job today, what would you do to get things under financial control?** Imagine this scenario and run through questions 1–3 above. If you quit your job to test other options, how could you later get back on the same career track if you absolutely had to?
5. **What are you putting off out of fear?** Usually, what we most fear doing is what we most need to do. That phone call, that conversation, whatever the action might be—it is fear of unknown outcomes that prevents us from doing what we need to do. Define the worst case, accept it, and do it. I'll repeat something you might consider tattooing on your forehead: *What we fear doing most is usually what we most need to do.* As I have heard said, a person's success in life can usually be measured by the number of uncomfortable conversations he or she is willing to have. Resolve to do one thing every day that you fear. I got into this habit by attempting to contact celebrities and famous businesspeople for advice.
6. **What is it costing you—financially, emotionally, and physically—to postpone action?** Don't only evaluate the potential downside of action. It is equally important to measure the atrocious cost of inaction. If you don't pursue those things that excite you, where will you be in one year, five years, and ten years? How will you feel having allowed circumstance to impose itself upon you and having allowed ten more years of your finite life to pass doing what you know will not fulfill you? If you telescope out 10 years and know with 100% certainty that it is a path of disappointment and regret, and if we define risk as "the likelihood of an irreversible negative outcome," inaction is the greatest risk of all.
7. **What are you waiting for?** If you cannot answer this without resorting to the previously rejected concept of good timing, the answer is simple: You're afraid, just like the rest of the world. Measure the cost of inaction, realize the unlikelihood and re-pairability of most missteps, and develop the most important habit of those who excel and enjoy doing so: action.

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[5]. www.nexussurf.com

[6]. This turned out to be yet another self-imposed limitation and false construct. BrainQUICKEN was acquired by a private equity firm in 2009. The process is described on www.fourhourblog.com.

[7]. http://www.tpl.org/tier3_cd.cfm?content_item_id=5307&folder_id=1545.

❹

System Reset

► BEING UNREASONABLE AND UNAMBIGUOUS

"Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where …" said Alice.

> “Then it doesn’t matter which way you go,” said the Cat.
>
> —LEWIS CARROLL, *Alice in Wonderland*

> The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man.
>
> —GEORGE BERNARD SHAW, *Maxims for Revolutionists*

SPRING 2005 / PRINCETON , NEW JERSEY

I had to bribe them. What other choice did I have?

They formed a circle around me, and, while the names differed, the question was one and the same: “What’s the challenge?” All eyes were on me.

My lecture at Princeton University had just ended with excitement and enthusiasm. At the same time, I knew that most students would go out and promptly do the opposite of what I preached. Most of them would be putting in 80-hour weeks as high-paid coffee fetchers unless I showed that the principles from class could actually be applied.

Hence the challenge.

I was offering a round-trip ticket anywhere in the world to anyone who could complete an undefined “challenge” in the most impressive fashion possible. Results plus style. I told them to meet me after class if interested, and here they were, nearly 20 out of 60 students.

The task was designed to test their comfort zones while forcing them to use some of the tactics I teach. It was simplicity itself: Contact three seemingly impossible-to-reach people—J.Lo, Bill Clinton, J. D. Salinger, I don’t care—and get at least one to reply to three questions.

Of 20 students, all frothing at the mouth to win a free spin across the globe, how many completed the challenge?

Exactly … none. Not a one.

There were many excuses: “It’s not that easy to get someone to …” “I have a big paper due, and …” “I would love to, but there’s no way I can….” There was but one real reason, however, repeated over and over again in different words: It was a difficult challenge, perhaps impossible, and the other students would outdo them. Since all of them overestimated the competition, no one even showed up.

According to the rules I had set, if someone had sent me no more than an illegible one-paragraph response, I would have been obligated to give them the prize. This result both fascinated and depressed me.

The following year, the outcome was quite different.

I told the above cautionary tale and 6 out of 17 finished the challenge in less than 48 hours. Was the second class better? No. In fact, there were more capable students in the first class, but they did nothing. Firepower up the wazoo and no trigger finger.

The second group just embraced what I told them before they started, which was …

Doing the Unrealistic Is Easier Than Doing the Realistic

From contacting billionaires to rubbing elbows with celebrities—the second group of students did both—it's as easy as believing it can be done.

It's lonely at the top. Ninety-nine percent of people in the world are convinced they are incapable of achieving great things, so they aim for the mediocre. The level of competition is thus fiercest for "realistic" goals, paradoxically making them the most time-and energy-consuming. It is easier to raise $1,000,000 than it is $100,000. It is easier to pick up the one perfect 10 in the bar than the five 8s.

If you are insecure, guess what? The rest of the world is, too. Do not overestimate the competition and underestimate yourself. You are better than you think.

Unreasonable and unrealistic goals are easier to achieve for yet another reason.

Having an unusually large goal is an adrenaline infusion that provides the endurance to overcome the inevitable trials and tribulations that go along with any goal. Realistic goals, goals restricted to the average ambition level, are uninspiring and will only fuel you through the first or second problem, at which point you throw in the towel. If the potential payoff is mediocre or average, so is your effort. I'll run through walls to get a catamaran trip through the Greek islands, but I might not change my brand of cereal for a weekend trip through Columbus, Ohio. If I choose the latter because it is "realistic," I won't have the enthusiasm to jump even the smallest hurdle to accomplish it. With beautiful, crystal-clear Greek waters and delicious wine on the brain, I'm prepared to do battle for a dream that is worth dreaming. Even though their difficulty of achievement on a scale of 1–10 appears to be a 10 and a 2 respectively, Columbus is more likely to fall through.

The fishing is best where the fewest go, and the collective insecurity of the world makes it easy for people to hit home runs while everyone else is aiming for base hits. There is just less competition for bigger goals.

Doing big things begins with asking for them properly.

What Do You Want? A Better Question, First of All

Most people will never know what they want. I don't know what I want. If you ask me what I want to do in the next five months for language learning, on the other hand, I do know. It's a matter of specificity. "What do you want?" is too imprecise to produce a meaningful and actionable answer. Forget about it.

"What are your goals?" is similarly fated for confusion and guesswork. To rephrase the question, we need to take a step back and look at the bigger picture.

Let's assume we have 10 goals and we achieve them—what is the desired outcome that makes all the effort worthwhile? The most common response is what I also would have suggested five years ago: happiness. I no longer believe this is a good answer. Happiness can be bought with a bottle of wine and has become ambiguous through overuse. There is a more precise alternative that reflects what I believe the actual objective is.

Bear with me. What is the opposite of happiness? Sadness? No. Just as love and hate are two sides of the same coin, so are happiness and sadness. Crying out of happiness is a perfect illustration of this. The opposite of love is indifference, and the opposite of happiness is—here's the clincher—boredom.

Excitement is the more practical synonym for happiness, and it is precisely what you should strive to chase. It is the cure-all. When people suggest you follow your "passion" or your "bliss," I propose that they are, in fact, referring to the same singular concept: excitement.

This brings us full circle. The question you should be asking isn't, "What do I want?" or "What are my goals?" but "What would excite me?"

Adult-Onset ADD: Adventure Deficit Disorder

Somewhere between college graduation and your second job, a chorus enters your internal dialogue: Be realistic and stop pretending. Life isn't like the movies.

If you're five years old and say you want to be an astronaut, your parents tell you that you can be anything you want to be. It's harmless, like telling a child that Santa Claus exists. If you're 25 and announce you want to start a new circus, the response is different: Be realistic; become a lawyer or an accountant or a doctor, have babies, and raise them to repeat the cycle.

If you do manage to ignore the doubters and start your own business, for example, ADD doesn't disappear. It just takes a different form.

When I started BrainQUICKEN LLC in 2001, it was with a clear goal in mind: Make $1,000 per day whether I was banging my head on a laptop or cutting my toenails on the beach. It was to be an automated source of cash flow. If you look at my chronology, it is obvious that this didn't happen until a meltdown forced it, despite the requisite income. Why? The goal wasn't specific enough. I hadn't defined *alternate activities* that would replace the initial workload. Therefore, I just continued working, even though there was no financial need. I needed to feel productive and had no other vehicles.

This is how most people work until death: "I'll just work until I have X dollars and then do what I want." If you don't define the "what I want" alternate activities, the X figure will increase indefinitely to avoid the fear-inducing uncertainty of this void.

This is when both employees and entrepreneurs become fat men in red BMWs.

The Fat Man in the Red BMW Convertible

There have been several points in my life—among them, just before I was fired from TrueSAN and just before I escaped the U.S. to avoid taking an Uzi into McDonald's—at which I saw my future as another fat man in a midlife-crisis BMW. I simply looked at those who were 15–20 years ahead of me on the same track, whether a director of sales or an entrepreneur in the same industry, and it scared the hell out of me.

It was such an acute phobia, and such a perfect metaphor for the sum of all fears, that it became a pattern interrupt between myself and fellow lifestyle designer and entrepreneur Douglas Price. Doug and I traveled parallel paths for nearly five years, facing the same challenges and self-doubt and thus keeping a close psychological eye on each other. Our down periods seem to alternate, making us a good team.

Whenever one of us began to set our sights lower, lose faith, or "accept reality," the other would chime in via phone or e-mail like an A A sponsor: "Dude, are you turning into the bald fat man in the red BMW convertible?" The prospect was terrifying enough that we always got our asses and priorities back on track immediately. The worst that could happen wasn't crashing and burning, it was accepting terminal boredom as a tolerable status quo.

Remember—boredom is the enemy, not some abstract "failure."

Correcting Course: Get Unrealistic

There is a process that I have used, and still use, to reignite life or correct course when the Fat Man in the BMW rears his ugly head. In some form or another, it is the same process used by the most impressive **NR** I have met around the world: dreamlining. Dreamlining is so named because it applies timelines to what most would consider dreams.

It is much like goal-setting but differs in several fundamental respects:

1. The goals shift from ambiguous wants to defined steps.
2. The goals have to be unrealistic to be effective.
3. It focuses on activities that will fill the vacuum created when work is removed. *Living* like a millionaire requires *doing* interesting things and not just owning enviable things.

Now it's your turn to think big.

How to Get George Bush Sr. or the CEO of Google on the Phone

The article below, titled "Fail Better" and written by Adam Gottesfeld, explores how I teach Princeton students to connect with luminary-level business mentors and celebrities of various types. I've edited it for length in a few places.

People are fond of using the "it's not what you know, it's who you know" adage as an excuse for inaction, as if all successful people are born with powerful friends.

Nonsense.

Here's how normal people build supernormal networks.

Fail Better

BY ADAM GOTTESFELD

MOST PRINCETON students love to procrastinate in writing their dean's date [term] papers. Ryan Marrinan '07, from Los Angeles, was no exception. But while the majority of undergraduates fill their time by updating their Facebook profiles or watching videos on YouTube, Marrinan was discussing Soto Zen Buddhism via e-mail with Randy Komisar, a partner at the venture capital firm Kleiner Perkins Caufield and Byers, and asking Google CEO Eric Schmidt via e-mail when he had been happiest in his life. (Schmidt's answer: "Tomorrow.")

Prior to his e-mail, Marrinan had never contacted Komisar. He had met Schmidt, a Princeton University trustee, only briefly at an academic affairs meeting of the trustees in November. A self-described "naturally shy kid," Marrinan said he would never have dared to randomly e-mail two of the most powerful men in Silicon Valley if it weren't for Tim Ferriss, who offered a guest lecture in seniors to contact high-profile celebrities and CEOs and get their answers to questions they have always wanted to ask.

For extra incentive, Ferriss promised the student who could contact the most hard-to-reach name and ask the most intriguing question a round-trip plane ticket anywhere in the world.

“I believe that success can be measured in the number of uncomfortable conversations you’re willing to have. I felt that if I could help students overcome the fear of rejection with cold-calling and cold e-mail, it would serve them forever,” Ferriss said. “It’s easy to sell yourself short, but when you see classmates getting responses from people like [former president] George Bush, the CEOs of Disney, Comcast, Google, and HP, and dozens of other impossible-to-reach people, it forces you to reconsider your self-set limitations.” … Ferriss lectures to the students of “High-Tech Entrepreneurship” each semester about creating a startup and designing the ideal lifestyle.

“I participate in this contest every day,” said Ferriss. “I do what I always do: find a personal e-mail if possible, often through their little-known personal blogs, send a two- to three-paragraph e-mail which explains that I am familiar with their work, and ask one simple-to-answer but thought-provoking question in that e-mail related to their work or life philosophies. The goal is to start a dialogue so they take the time to answer future e-mails—not to ask for help. That can only come after at least three or four genuine e-mail exchanges.”

With “textbook execution of the Tim Ferriss Technique,” as he put it, Marrinan was able to strike up a bond with Komisar. In his initial e-mail, he talked about reading one of Komisar’s *Harvard Business Review* articles and feeling inspired to ask him, “When were you happiest in your life?” After Komisar replied with references to Tibetan Buddhism, Marrinan responded, “Just as words are inadequate to explain true happiness, so too are words inadequate to express my thanks.” His e-mail included his personal translation of a French poem by Taisen Deshimaru, the former European head of Soto Zen. An e-mail relationship was formed, and Komisar even e-mailed Marrinan a few days later with a link to a *New York Times* article on happiness.

Contacting Schmidt proved more challenging. For Marrinan, the toughest part was getting Schmidt’s personal e-mail address. He e-mailed a Princeton dean asking for it. No response. Two weeks later, he e-mailed the same dean again, defending his request by reminding her that he had previously met Schmidt. The dean said no, but Marrinan refused to give up. He e-mailed her a third time. “Have you ever made an exception?” he asked. The dean finally gave in, he said, and provided him with Schmidt’s e-mail.

“I know some of my classmates pursued the alternative scattershot technique with some success, but that’s not my bag,” Marrinan said, explaining his perseverance. “I deal with rejection by persisting, not by taking my business elsewhere. My maxim comes from Samuel Beckett, a personal hero of mine: ‘Ever tried. Ever failed. No matter. Try again. Fail again. Fail better.’ You won’t believe what you can accomplish by attempting the impossible with the courage to repeatedly fail better.”

Nathan Kaplan, another participant in the contest, was most proud of the way that he was able to contact former Newark mayor Sharpe James. Because James had made a campaign contribution to Al Sharpton, the website www.fundrace.org listed James’s home address. Kaplan then input James’s address into an online serach-by-address phone directory, through which he received the former mayor’s phone number. Kaplan left a message for James, and a few days later finally got to ask him about childhood education.

Ferriss is proud of the effort students have put into his contest. “Most people can do absolutely awe-inspiring things,” he said. “Sometimes they just need a little nudge.”

► Q&A: QUESTIONS AND ACTIONS

The existential vacuum manifests itself mainly in a state of boredom.

—VIKTOR FRANKL, Auschwitz survivor and founder of Logotherapy, *Man's Search for Meaning*

Life is too short to be small.

—BENJAMIN DISRAELI

Dreamlining will be fun, and it will be hard. The harder it is, the more you need it. To save time, I recommend using the automatic calculators and forms at www.fourhourblog.com. Refer to the model worksheet as you complete the following steps:

1. **What would you do if there were no way you could fail? If you were 10 times smarter than the rest of the world?**

Create two timelines—6 months and 12 months—and list up to five things you dream of *having* (including, but not limited to, material wants: house, car, clothing, etc.), *being* (be a great cook, be fluent in Chinese, etc.), and *doing* (visiting Thailand, tracing your roots overseas, racing ostriches, etc.) in that order. If you have difficulty identifying what you want in some categories, as most will, consider what you hate or fear in each and write down the opposite. Do not limit yourself, and do not concern yourself with how these things will be accomplished. For now, it's unimportant. This is an exercise in reversing repression.

Be sure not to judge or fool yourself. If you really want a Ferrari, don't put down solving world hunger out of guilt. For some, the dream will be fame, for others fortune or prestige. All people have their vices and insecurities. If something will improve your feeling of self-worth, put it down. I have a racing motorcycle, and quite apart from the fact that I love speed, it just makes me feel like a cool dude. There is nothing wrong with that. Put it all down.

2. **Drawing a blank?**

For all their bitching about what's holding them back, most people have a lot of trouble coming up with the defined dreams they're being held from. This is particularly true with the "doing" category. In that case, consider these questions:

1. What would you do, day to day, if you had $100 million in the bank?
2. What would make you most excited to wake up in the morning to another day?

Don't rush—think about it for a few minutes. If still blocked, fill in the five "doing" spots with the following:

one place to visit
one thing to do before you die (a memory of a lifetime)
one thing to do daily
one thing to do weekly
one thing you've always wanted to learn

3. **What does "being" entail doing?**

Convert each "being" into a "doing" to make it actionable. Identify an action that would characterize this state of being or a task that would mean you had achieved it. People find it easier to brainstorm "being" first, but this column is just a temporary holding spot for "doing" actions. Here are a few examples:

Great cook → *make Christmas dinner without help*

Fluent in Chinese → *have a five-minute conversation with a Chinese co-worker*

4. **What are the four dreams that would change it all?**
Using the 6-month timeline, star or otherwise highlight the four most exciting and/or important dreams from all columns. Repeat the process with the 12-month timeline if desired.

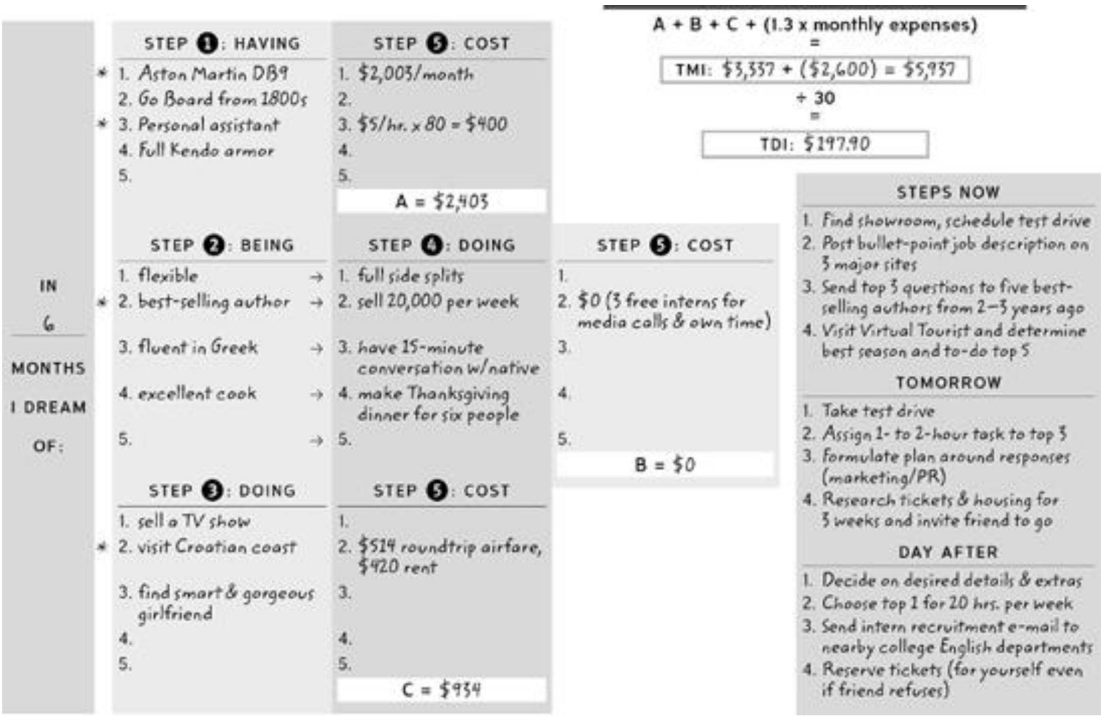
5. **Determine the cost of these dreams and calculate your Target Monthly Income (TMI) for both timelines**.
If financeable, what is the cost per month for each of the four dreams (rent, mortgage, payment plan installments, etc.)? Start thinking of income and expense in terms of monthly cash flow—dollars in and dollars out—instead of grand totals. Things often cost much, much less than expected. For example, a Lamborghini Gallardo Spyder, fresh off the showroom floor at $260,000, can be had for $2,897.80 per month. I found my personal favorite, an Aston Martin DB9 with 1,000 miles on it, through eBay for $136,000—$2,003.10 per month. How about a Round-the-World trip (Los Angeles . . . Tokyo . . . Singapore . . . Bangkok . . . Delhi or Bombay . . . London . . . Frankfurt . . . Los Angeles) for $1,399?

For some of these costs, the Tools and Tricks at the end of Chapter 14 will help.

Last, calculate your Target Monthly Income (TMI) for realizing these dreamlines. This is how to do it: First, total each of the columns A, B, and C, counting only the four selected dreams. Some of these column totals could be zero, which is fine. Next, add your total monthly expenses **x** 1.3 (the 1.3 represents your expenses plus a 30% buffer for safety or savings). This grand total is your TMI and the target to keep in mind for the rest of the book. I like to further divide this TMI by 30 to get my TDI—Target Daily Income. I find it easier to work with a daily goal. Online calculators on our companion site do all the work for you and make this step a cinch.

Chances are that the figure is lower than expected, and it often decreases over time as you trade more and more "having" for once-in-a-lifetime "doing." Mobility encourages this trend. Even if the total is intimidating, don't fret in the least. I have helped students get to more than $10,000 per month in extra income within three months.

Sample Dreamline



IN 6 MONTHS I DREAM OF:

STEP ❶: HAVING
* 1. Aston Martin DB9
2. Go Board from 1800s
* 3. Personal assistant
4. Full Kendo armor
5.

STEP ❺: COST
1. $2,003/month
2.
3. $5/hr. x 80 = $400
4.
5.

A = $2,403

STEP ❷: BEING
1. flexible →
* 2. best-selling author →
3. fluent in Greek →
4. excellent cook →
5. →

STEP ❹: DOING
1. full side splits
2. sell 20,000 per week
3. have 15-minute conversation w/native
4. make Thanksgiving dinner for six people
5.

STEP ❺: COST
1.
2. $0 (3 free interns for media calls & own time)
3.
4.
5.

B = $0

STEP ❸: DOING
1. sell a TV show
* 2. visit Croatian coast
3. find smart & gorgeous girlfriend
4.
5.

STEP ❺: COST
1.
2. $514 roundtrip airfare, $920 rent
3.
4.
5.

C = $934

A + B + C + (1.3 x monthly expenses)
=
TMI: $3,337 + ($2,600) = $5,937
÷ 30
=
TDI: $197.90

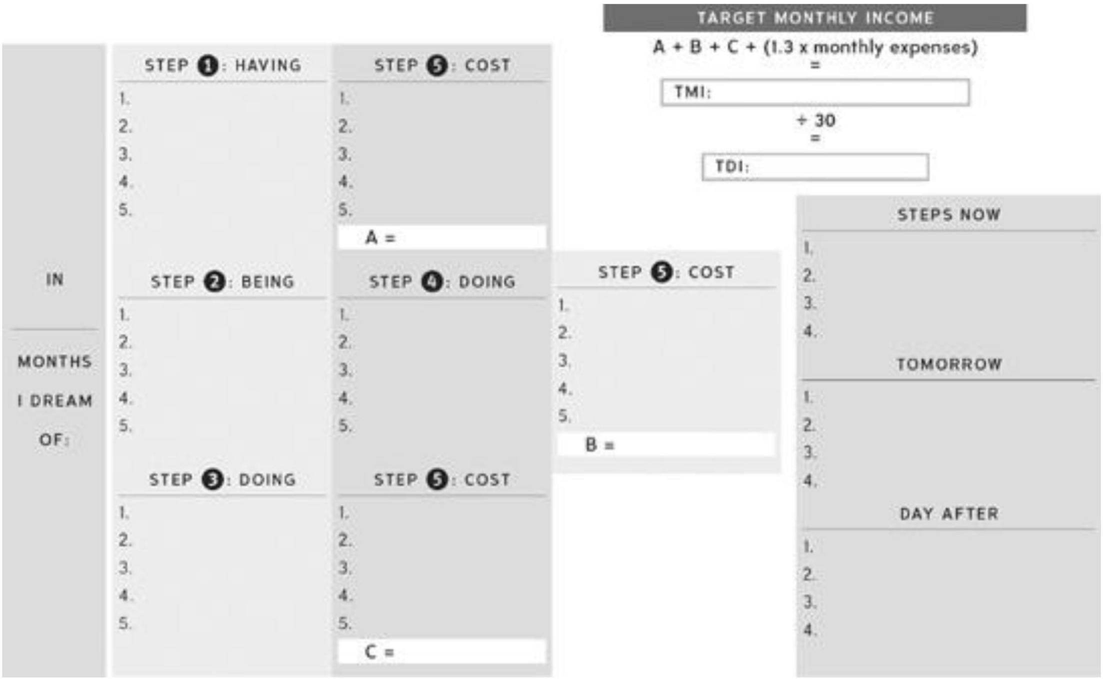
STEPS NOW
1. Find showroom, schedule test drive
2. Post bullet-point job description on 3 major sites
3. Send top 3 questions to five best-selling authors from 2–3 years ago
4. Visit Virtual Tourist and determine best season and to-do top 5

TOMORROW
1. Take test drive
2. Assign 1- to 2-hour task to top 3
3. Formulate plan around responses (marketing/PR)
4. Research tickets & housing for 3 weeks and invite friend to go

DAY AFTER
1. Decide on desired details & extras
2. Choose top 1 for 20 hrs. per week
3. Send intern recruitment e-mail to nearby college English departments
4. Reserve tickets (for yourself even if friend refuses)

Dreamline

(Go to www.fourhourblog.com for larger printable worksheets and online calculators.)



IN ___ MONTHS I DREAM OF:

STEP ❶: HAVING
1.
2.
3.
4.
5.

STEP ❺: COST
1.
2.
3.
4.
5.

A =

STEP ❷: BEING
1.
2.
3.
4.
5.

STEP ❹: DOING
1.
2.
3.
4.
5.

STEP ❺: COST
1.
2.
3.
4.
5.

B =

STEP ❸: DOING
1.
2.
3.
4.
5.

STEP ❺: COST
1.
2.
3.
4.
5.

C =

TARGET MONTHLY INCOME
A + B + C + (1.3 x monthly expenses)
=
TMI:
÷ 30
=
TDI:

STEPS NOW
1.
2.
3.
4.

TOMORROW
1.
2.
3.
4.

DAY AFTER
1.
2.
3.
4.

Dreamline Math—Another Good Option

There could be a different way of handling monthly and one-time goals. I'll use your example of an Aston Martin's monthly payment, a personal assistant's monthly payment, and a trip to the Croatian coast. While the first two should certainly be totaled and included in your target monthly income, the trip is something that should be divided by the number of months between now and the dreamline's total time.

Thus if you had a six-month dreamline:

Aston Martin = 2,003 per month
Personal assistant = 400 per month
Croatian trip = 934 total, and thus 934/6 per month

Right now in the book and in the spreadsheet we have (2003 + 400 + 934) **x** 1.3 monthly expenses = Target Monthly Income (or TMI).

But I think it should be (2003 + 400 + 934/6 **x** 1.3 monthly expenses = TMI.

Or, more generally: [Monthly Goals + (One-Time Goals / Total Months)] **x** 1.3 monthly expenses = TMI.

— ***JARED, president, SET Consulting***

6. **Determine *three steps* for each of the *four dreams* in just the 6-month timeline and take the first step *now*.**

I'm not a big believer in long-term planning and far-off goals. In fact, I generally set 3-month and 6-month dreamlines. The variables change too much and in-the-future distance becomes an excuse for postponing action. The objective of this exercise isn't, therefore, to outline every step from start to finish, but to define the end goal, the required vehicle to achieve them (TMI, TDI), and build momentum with critical first steps. From that point, it's a matter of freeing time and generating the TMI, which the following chapters cover.

First, let's focus on those critical first steps. Define three steps for each dream that will get you closer to its actualization. Set actions—simple, well-defined actions—for now, tomorrow (complete before 11 A.M.) and the day after (again completed before 11 A.M.).

Once you have three steps for each of the four goals, complete the three actions in the "now" column. Do it now. Each should be simple enough to do in five minutes or less. If not, rachet it down. If it's the middle of the night and you can't call someone, do something else now, such as send an e-mail, and set the call for first thing tomorrow.

If the next stage is some form of research, get in touch with someone who knows the answer instead of spending too much time in books or online, which can turn into paralysis by analysis. The best first step, the one I recommend, is finding someone who's done it and ask for advice on how to do the same. It's not hard.

Other options include setting a meeting or phone call with a trainer, mentor, or salesperson to build momentum. Can you schedule a private class or a commitment that you'll feel bad about canceling? Use guilt to your advantage.

Tomorrow becomes never. No matter how small the task, take the first step now!

► COMFORT CHALLENGE

The most important actions are never comfortable.

Fortunately, it is possible to condition yourself to discomfort and overcome it. I've trained myself to propose solutions instead of ask for them, to elicit desired responses instead of react, and to be assertive without burning bridges. To have an uncommon lifestyle, you need to *develop the uncommon habit of making decisions, both for yourself and for others.*

From this chapter forward, I'll take you through progressively more uncomfortable exercises, simple and small. Some of the exercises will appear deceptively easy and even irrelevant (such as the next) until you try them. Look at it as a game and expect some butterflies and sweat—that's the whole point. For most of these exercises, the duration is two days. Mark the exercise of the day on your calendar so you don't forget, and don't attempt more than one Comfort Challenge at a time.

Remember: There is a direct correlation between an increased sphere of comfort and getting what you want.

Here we go.

Learn to Eye Gaze (2 days)

My friend Michael Ellsberg invented a singles event called Eye Gazing. It is similar to speed dating but different in one fundamental respect—no speaking is permitted. It involves gazing into the eyes of each partner for three minutes at a time. If you go to such an event, it becomes clear how uncomfortable most people are doing this. For the next two days, practice gazing into the eyes of others—whether people you pass on the street or conversational partners—until they break contact. Hints:

1. Focus on one eye and be sure to blink occasionally so you don't look like a psychopath or get your ass kicked.
2. In conversation, maintain eye contact when you are speaking. It's easy to do while listening.
3. Practice with people bigger or more confident than yourself. If a passerby asks you what the hell you're staring at, just smile and respond, "Sorry about that. I thought you were an old friend of mine."

Step II:
E is for Elimination

One does not accumulate but eliminate . It is not daily increase but daily decrease. The height of cultivation always runs to simplicity .

—BRUCE LEE

❺

The End of Time Management

► ILLUSIONS AND ITALIANS

> Perfection is not when there is no more to add, but no more to take away.
>
> —ANTOINE DE SAINT-EXUPÉRY, pioneer of international postal flight and author of *Le Petit Prince (The Little Prince)*

> It is vain to do with more what can be done with less.
>
> —WILLIAM OF OCCAM (1300–1350), originator of “Occam’s Razor”

Just a few words on time management: Forget all about it.

In the strictest sense, you shouldn’t be trying to do more in each day, trying to fill every second with a work fidget of some type. It took me a long time to figure this out. I used to be very fond of the results-by-volume approach.

Being busy is most often used as a guise for avoiding the few critically important but uncomfortable actions. The options are almost limitless for creating “busyness”: You could call a few hundred unqualified sales leads, reorganize your Outlook contacts, walk across the office to request documents you don’t really need, or fuss with your BlackBerry for a few hours when you should be prioritizing.

In fact, if you want to move up the ladder in most of corporate America, and assuming they don’t really check what you are doing (let’s be honest), just run around the office holding a cell phone to your head and carrying papers. Now, that is one busy employee! Give them a raise. Unfortunately for the **NR**, this behavior won’t get you out of the office or put you on an airplane to Brazil. Bad dog. Hit yourself with a newspaper and cut it out.

After all, there is a far better option, and it will do more than simply increase your results—it will multiply them. Believe it or not, it is not only possible to accomplish more by doing less, it is mandatory.

Enter the world of elimination.

How You Will Use Productivity

Now that you have defined what you want to do with your time, you have to free that time. The trick, of course, is to do so while maintaining or increasing your income.

The intention of this chapter, and what you will experience if you follow the instructions, is an increase in personal productivity between 100 and 500%. The *principles* are the same for both employees and entrepreneurs, but the *purpose* of this increased productivity is completely different.

First, the employee. The employee is increasing productivity to increase negotiating leverage for two simultaneous objectives: pay raises and a remote working arrangement.

Recall that, as indicated in the first chapter of this book, the general process of joining the New Rich is **D-E-A-L**, in that order, but that employees intent on remaining employees for now need to implement the process as **D-E-L-A**. The reason relates to environment. They need to **Liberate** themselves from the office environment before they can work ten hours a week, for example, because the expectation in that environment is that you will be in constant motion from 9–5. Even if you produce twice the results you had in the past, if you're working a quarter of the hours of your colleagues, there is a good chance of receiving a pink slip. Even if you work 10 hours a week and produce twice the results of people working 40, the collective request will be, "Work 40 hours a week and produce 8 times the results." This is an endless game and one you want to avoid. Hence the need for **Liberation** first.

If you're an employee, this chapter will increase your value and make it more painful for the company to fire you than to grant raises and a remote working agreement. That is your goal. Once the latter is accomplished, you can drop hours without bureaucratic interference and use the resultant free time to fulfill dreamlines.

The entrepreneur's goals are less complex, as he or she is generally the direct beneficiary of increased profit. The goal is to decrease the amount of work you perform while increasing revenue. This will set the stage for replacing yourself with **Automation**, which in turn permits **Liberation**.

For both tracks, some definitions are in order.

Being Effective vs. Being Efficient

Effectiveness is doing the things that get you closer to your goals. Efficiency is performing a given task (whether important or not) in the most economical manner possible. Being efficient without regard to effectiveness is the default mode of the universe.

I would consider the best door-to-door salesperson efficient—that is, refined and excellent at selling door-to-door without wasting time—but utterly ineffective. He or she would sell more using a better vehicle such as e-mail or direct mail.

This is also true for the person who checks e-mail 30 times per day and develops an elaborate system of folder rules and sophisticated techniques for ensuring that each of those 30 brain farts moves as quickly as possible. I was a specialist at such professional wheel-spinning. It is efficient on some perverse level, but far from effective.

Here are two truisms to keep in mind:

1. Doing something unimportant well does not make it important.
2. Requiring a lot of time does not make a task important.

From this moment forward, remember this: *What* you do is infinitely more important than *how* you do it. Efficiency is still important, but it is useless unless applied to the right things.

To find the right things, we'll need to go to the garden.

Pareto and His Garden: 80/20 and Freedom from Futility

What gets measured gets managed.

—PETER DRUCKER, management theorist, author of 31 books, recipient of Presidential Medal of Freedom

Four years ago, an economist changed my life forever. It's a shame I never had a chance to buy him a drink. My dear Vilfredo died almost 100 years ago.

Vilfredo Pareto was a wily and controversial economist-cum-sociologist who lived from 1848 to 1923. An engineer by training, he started his varied career managing coal mines and later succeeded Léon Walras as the chair of political economy at the University of Lausanne in Switzerland. His seminal work, *Cours d'economie politique*, included a then little-explored "law" of income distribution that would later bear his name: "Pareto's Law" or the "Pareto Distribution," in the last decade also popularly called the "80/20 Principle."

The mathematical formula he used to demonstrate a grossly uneven but predictable distribution of wealth in society—80% of the wealth and income was produced and possessed by 20% of the population—also applied outside of economics. Indeed, it could be found almost everywhere. Eighty percent of Pareto's garden peas were produced by 20% of the peapods he had planted, for example.

Pareto's Law can be summarized as follows: 80% of the outputs result from 20% of the inputs. Alternative ways to phrase this, depending on the context, include:

80% of the consequences flow from 20% of the causes.

80% of the results come from 20% of the effort and time.

80% of company profits come from 20% of the products and customers.

80% of all stock market gains are realized by 20% of the investors and 20% of an individual portfolio.

The list is infinitely long and diverse, and the ratio is often skewed even more severely: 90/10, 95/5, and 99/1 are not uncommon, but the minimum ratio to seek is 80/20.

When I came across Pareto's work one late evening, I had been slaving away with 15-hour days seven days per week, feeling completely overwhelmed and generally helpless. I would wake up before dawn to make calls to the United Kingdom, handle the U.S. during the normal 9–5 day, and then work until near midnight making calls to Japan and New Zealand. I was stuck on a runaway freight train with no brakes, shoveling coal into the furnace for lack of a better option. Faced with certain burnout or giving Pareto's ideas a trial run, I opted for the latter. The next morning, I began a dissection of my business and personal life through the lenses of two questions:

1. Which 20% of sources are causing 80% of my problems and unhappiness?
2. Which 20% of sources are resulting in 80% of my desired outcomes and happiness?

For the entire day, I put aside everything seemingly urgent and did the most intense truth-baring analysis possible, applying these questions to everything from my friends to customers and advertising to relaxation activities. Don't expect to find you're doing everything right—the truth often hurts. The goal is to find your inefficiencies in order to eliminate them and to find your strengths so you can multiply them. In the 24 hours that followed, I made several simple but emotionally difficult decisions that literally changed my life forever and enabled the lifestyle I now enjoy.

The first decision I made is an excellent example of how dramatic and fast the ROI of this analytical fat-cutting can be: I stopped contacting 95% of my customers and fired 2%, leaving me with the top 3% of producers to profile and duplicate.

Out of more than 120 wholesale customers, a mere 5 were bringing in 95% of the revenue. I was spending 98% of my time chasing the remainder, as the aforementioned 5 ordered regularly without any follow-up calls, persuasion, or cajoling. In other words, I was working because I felt as though I should be doing something from 9–5. I didn't realize that working every hour from 9–5 isn't the goal; it's simply the structure most people use, whether it's necessary or not. I had a severe case of work-for-work (W4W), the most-hated acronym in the **NR** vocabulary.

All, and I mean 100%, of my problems and complaints came from this unproductive majority, with the exception of two large customers who were simply world-class experts of the "here is the fire I started, now you put it out" approach to business. I put all of these unproductive customers on passive mode: If they ordered, great—let them fax in the order. If not, I would do absolutely no chasing: no phone calls, no e-mail, nothing. That left the two larger customers to deal with, who were professional ball breakers but contributed about 10% to the bottom line at the time.

You'll always have a few of these, and it is a quandary that causes all sorts of problems, not the least of which are self-hatred and depression. Up to that point, I had taken their browbeating, insults, time-consuming arguments, and tirades as a cost of doing business. I realized during the 80/20 analysis that these two people were the source of nearly all my unhappiness and anger throughout the day, and it usually spilled over into my personal time, keeping me up at night with the usual "I should have said X, Y, and Z to that penis" self-flagellation. I finally concluded the obvious: The effect on my self-esteem and state of mind just wasn't worth the financial gain. I didn't need the money for any precise reason, and I had assumed I needed to take it. The customers are always right, aren't they? Part of doing business, right? Hell, no. Not for the **NR**, anyway. I fired their asses and enjoyed every second of it. The first conversation went like this:

Customer: What the &#@$? I ordered two cases and they arrived two days late. [Note: He had sent the order to the wrong person via the wrong medium, despite repeated reminders.] You guys are the most disorganized bunch of idiots I've ever worked with. I have 20 years of experience in this industry, and this is the worst.

Any NR—in this case, me: I will kill you. Be afraid, be very afraid.

I wish. I did rehearse that a million times in my mental theater, but it actually went something more like this:

I'm sorry to hear that. You know, I've been taking your insults for a while now, and it's unfortunate that it seems we won't be able to do business anymore. I'd recommend you take a good look at where this unhappiness and anger is actually coming from. In any case, I wish you well. If you would like to order product, we'll be happy to supply it, but only if you can conduct yourself without profanity and unnecessary insults. You have our fax number. All the best and have a nice day. [Click.]

I did this once via phone and once through e-mail. So what happened? I lost one customer, but the other corrected course and simply faxed orders, again and again and again. Problem solved, minimum revenue lost. I was immediately 10 times happier.

I then identified the common characteristics of my top-five customers and secured three or so similarly profiled buyers in the following week. Remember, more customers is not automatically more income. More customers is not the goal and often translates into 90% more housekeeping and a paltry 1–3% increase in income. Make no mistake, maximum income from minimal necessary effort (including minimum number of customers) is the primary goal. I duplicated my strengths, in this case my top producers, and focused on increasing the size and frequency of their orders.

The end result? I went from chasing and appeasing 120 customers to simply receiving large orders from 8, with absolutely no pleading phone calls or e-mail haranguing. My monthly income increased from $30K to $60K in four weeks and my weekly hours immediately dropped from over 80 to approximately 15. Most important, I was happy with myself and felt both optimistic and liberated for the first time in over two years.

In the ensuing weeks, I applied the 80/20 Principle to dozens of areas, including the following:

1. Advertising

I identified the advertising that was generating 80% or more of revenue, identified the commonalities among them, and multiplied them, eliminating all the rest at the same time. My advertising costs dropped over 70% and my direct sales income nearly doubled from a monthly $15K to $25K in 8 weeks. It would have doubled immediately had I been using radio, newspapers, or television instead of magazines with long lead times.

2. Online Affiliates and Partners

I fired more than 250 low-yield online affiliates or put them in holding patterns to focus instead on the *two* affiliates who were generating 90% of the income. My management time decreased from 5–10 hours per week to 1 hour per month. Online partner income increased more than 50% in that same month.

Slow down and remember this: Most things make no difference. *Being busy is a form of laziness—lazy thinking and indiscriminate action.*

Being overwhelmed is often as unproductive as doing nothing, and is far more unpleasant. Being selective—doing less—is the path of the productive. Focus on the important few and ignore the rest.

Of course, before you can separate the wheat from the chaff and eliminate activities in a new environment (whether a new job or an entrepreneurial venture), you will need to try a lot to identify what pulls the most weight. Throw it all up on the wall and see what sticks. That's part of the process, but it should not take more than a month or two.

It's easy to get caught in a flood of minutiae, and the key to not feeling rushed is remembering that *lack of time is actually lack of priorities*. Take time to stop and smell the roses, or—in this case—to count the pea pods.

The 9–5 Illusion and Parkinson's Law

> I saw a bank that said "24-Hour Banking," but I don't have that much time.
>
> —STEVEN WRIGHT, comedian

If you're an employee, spending time on nonsense is, to some extent, not your fault. There is often no incentive to use time well unless you are paid on commission. The world has agreed to shuffle papers between 9:00 A.M. and 5:00 P.M., and since you're trapped in the office for that period of servitude, you are compelled to create activities to fill that time. Time is wasted because there is so much time available. It's understandable. Now that you have the new goal of negotiating a remote work arrangement instead of just collecting a paycheck, it's time to revisit the status quo and become effective. The best employees have the most leverage.

For the entrepreneur, the wasteful use of time is a matter of bad habit and imitation. I am no exception. Most entrepreneurs were once employees and come from the 9–5 culture. Thus they adopt the same schedule, whether or not they function at 9:00 A.M. or need 8 hours to generate their target income. This schedule is a collective social agreement and a dinosaur legacy of the results-by-volume approach. How is it possible that all the people in the world need exactly 8 hours to accomplish their work? It isn't. 9–5 is arbitrary.

You don't need 8 hours per day to become a legitimate millionaire—let alone have the means to live like one. Eight hours per week is often excessive, but I don't expect all of you to believe me just yet. I know you probably feel as I did for a long time: There just aren't enough hours in the day.

But let's consider a few things we can probably agree on.

Since we have 8 hours to fill, we fill 8 hours. If we had 15, we would fill 15. If we have an emergency and need to suddenly leave work in 2 hours but have pending deadlines, we miraculously complete those assignments in 2 hours.

It is all related to a law that was introduced to me by Ed Zschau in the spring of 2000.

I had arrived to class nervous and unable to concentrate. The final paper, worth a full 25% of the semester's grade, was due in 24 hours. One of the options, and that which I had chosen, was to interview the top executives of a start-up and provide an in-depth analysis of their business model. The corporate powers that be had decided last minute that I couldn't interview two key figures or use their information due to confidentiality issues and pre-IPO precautions. Game over.

I approached Ed after class to deliver the bad news.

"Ed, I think I'm going to need an extension on the paper." I explained the situation, and Ed smiled before he replied without so much as a hint of concern.

"I think you'll be OK. Entrepreneurs are those who make things happen, right?"

Twenty-four hours later and one minute before the deadline, as his assistant was locking the office, I handed in a 30-page final paper. It was based on a different company I had found, interviewed, and dissected with an intense all-nighter and enough caffeine to get an entire Olympic track team disqualified. It ended up being one of the best papers I'd written in four years, and I received an A.

Before I left the classroom the previous day, Ed had given me some parting advice: Parkinson's Law.

Parkinson's Law dictates that a task will swell in (perceived) importance and complexity in relation to the time allotted for its completion. It is the magic of the imminent deadline. If I give you 24 hours to complete a project, the time pressure forces you to focus on execution, and you have no choice but to do only the bare essentials. If I give you a week to complete the same task, it's six days of making a mountain out of a molehill. If I give you two months, God forbid, it becomes a mental monster. The end product of the shorter deadline is almost inevitably of equal or higher quality due to greater focus.

This presents a very curious phenomenon. There are two synergistic approaches for increasing productivity that are inversions of each other:

1. Limit tasks to the important to shorten work time (80/20).

2. Shorten work time to limit tasks to the important (Parkinson's Law).

The best solution is to use both together: Identify the few critical tasks that contribute most to income and schedule them with *very short* and clear deadlines.

If you haven't identified the mission-critical tasks and set aggressive start and end times for their completion, the unimportant becomes the important. Even if you know what's critical, without deadlines that create focus, the minor tasks forced upon you (or invented, in the case of the entrepreneur) will swell to consume time until another bit of minutiae jumps in to replace it, leaving you at the end of the day with nothing accomplished. How else could dropping off a package at UPS, setting a few appointments, and checking e-mail consume an entire 9–5 day? Don't feel bad. I spent months jumping from one interruption to the next, feeling run by my business instead of the other way around.

THE 80/20 PRINCIPLE and Parkinson's Law are the two cornerstone concepts that will be revisited in different forms throughout this entire section. Most inputs are useless and time is wasted in proportion to the amount that is available.

Fat-free performance and time freedom begins with limiting intake overload. In the next chapter, we'll put you on the real breakfast of champions: the Low-Information Diet.

A Dozen Cupcakes and One Question

Love of bustle is not industry.
—SENECA

MOUNTAIN VIEW, CALIFORNIA.

"Saturdays are my days off," I offered to the crowd of strangers staring at me, friends of a friend. It was true. Can you eat All-Bran and chicken seven days a week? Me neither. Don't be so judgmental.

Between my tenth and twelfth cupcakes, I plopped down on the couch to revel in the sugar high until the clock struck midnight and sent me back to my adultsville Sunday–Friday diet. There was another party guest seated next to me on a chair, nursing a glass of wine, not his twelfth but certainly not his first, and we struck up a conversation. As usual, I had to struggle to answer "What do you do?" and, as usual, my answer left someone to wonder whether I was a pathological liar or a criminal.

How was it possible to spend so little time on income generation? It's a good question. It's THE question.

In almost all respects, Charney had it all. He was happily married with a two-year-old son and another due to arrive in three months. He was a successful technology salesman, and though he wanted to earn $500,000 more per year as all do, his finances were solid.

He also asked good questions. I had just returned from another trip overseas and was planning a new adventure to Japan. He drilled me for two hours with a refrain: How is it possible to spend so little time on income generation?

"If you're interested, we can make you a case study and I'll show you how," I offered.

Charney was in. The one thing he didn't have was time.

One e-mail and five weeks of practice later, Charney had good news: He had accomplished more in the last week than he had in the previous four combined. He did so while taking Monday and Friday off and producing four times the results.

Was it from mountaintop retreats and secret kung fu training? Nope. Was it a new Japanese management secret or better software? Nein. I just asked him to do one simple thing consistently without fail.

At least three times per day at scheduled times, he had to ask himself the following question:

Am I being productive or just active?

Charney captured the essence of this with less-abstract wording:

Am I inventing things to do to avoid the important?

He eliminated all of the activities he used as crutches and began to focus on demonstrating results instead of showing dedication. Dedication is often just meaningless work in disguise. Be ruthless and cut the fat.

It is possible to have your cupcake and eat it, too.

► Q&A: QUESTIONS AND ACTIONS

> We create stress for ourselves because you feel like you have to do it. You *have* to. I don't feel that anymore.
>
> —OPRAH WINFREY, actress and talk-show host, *The Oprah Winfrey Show*

The key to having more time is doing less, and there are two paths to getting there, both of which should be used together: (1) Define a to-do list and (2) define a not-to-do list. In general terms, there are but two questions:

What 20% of sources are causing 80% of my problems and unhappiness?

What 20% of sources are resulting in 80% of my desired outcome and happiness?

Hypothetical cases help to get us started:

1. **If you had a heart attack and had to work two hours per day, what would you do?**
Not five hours, not four hours, not three—two hours. It's not where I want you to ultimately be, but it's a start. Besides, I can hear your brain bubbling already: That's ridiculous. Impossible! I know, I know. If I told you that you could survive for months, functioning quite well, on four hours of sleep per night, would you believe me? Probably not. Notwithstanding, millions of new mothers do it all the time. This exercise is not optional. The doctor has warned you, after triple-bypass surgery, that if you don't cut down your work to two hours per day for the first three months post-op, you will die. How would you do it?

2. **If you had a second heart attack and had to work two hours per *week*, what would you do?**

3. **If you had a gun to your head and *had* to stop doing 4/5 of different time-consuming activities, what would you remove?** Simplicity requires ruthlessness. If you had to stop 4⁄5 of time-consuming

activities—e-mail, phone calls, conversations, paperwork, meetings, advertising, customers, suppliers, products, services, etc.—what would you eliminate to keep the negative effect on income to a minimum? Used even once per month, this question alone can keep you sane and on track.

4. **What are the top-three activities that I use to fill time to feel as though I've been productive?** These are usually used to postpone more important actions (often uncomfortable because there is a chance of failure or rejection). Be honest with yourself, as we all do this on occasion. What are your crutch activities?

5. **Who are the 20% of people who produce 80% of your enjoyment and propel you forward, and which 20% cause 80% of your depression, anger, and second-guessing?**
Identify:

- ► Positive friends versus time-consuming friends: Who is helping versus hurting you, and how do you increase your time with the former while decreasing or eliminating your time with the latter?
- ► Who is causing me stress disproportionate to the time I spend with them? What will happen if I simply stop interacting with these people? Fear-setting helps here.
- ► When do I feel starved for time? What commitments, thoughts, and people can I eliminate to fix this problem?

Exact numbers aren't needed to realize that we spend too much time with those who poison us with pessimism, sloth, and low expectations of themselves and the world. It is often the case that you have to fire certain friends or retire from particular social circles to have the life you want. This isn't being mean; it is being practical. Poisonous people do not deserve your time. To think otherwise is masochistic.

The best way to approach a potential break is simple: Confide in them honestly but tactfully and explain your concerns. If they bite back, your conclusions have been confirmed. Drop them like any other bad habit. If they promise to change, first spend at least two weeks apart to develop other positive influences in your life and diminish psychological dependency. The next trial period should have a set duration and consist of pass-or-fail criteria.

If this approach is too confrontational for you, just politely refuse to interact with them. Be in the middle of something when the call comes, and have a prior commitment when the invitation to hang out comes. Once you see the benefits of decreased time with these people, it will be easier to stop communication altogether.

I'm not going to lie: It sucks. It hurts like pulling out a splinter. But you are the average of the five people you associate with most, so do not underestimate the effects of your pessimistic, unambitious, or disorganized friends. If someone isn't making you stronger, they're making you weaker.

Remove the splinters and you'll thank yourself for it.

6. **Learn to ask, "If this is the only thing I accomplish today, will I be satisfied with my day?"** Don't ever arrive at the office or in front of your computer without a clear list of priorities. You'll just read unassociated e-mail and scramble your brain for the day. Compile your to-do list for tomorrow no

later than this evening. I don't recommend using Outlook or computerized to-do lists, because it is possible to add an infinite number of items. I use a standard piece of paper folded in half three times, which fits perfectly in the pocket and limits you to noting only a few items.

There should never be more than two mission-critical items to complete each day. Never. It just isn't necessary if they're actually high-impact. If you are stuck trying to decide between multiple items that all seem crucial, as happens to all of us, look at each in turn and ask yourself, *If this is the only thing I accomplish today, will I be satisfied with my day?*

To counter the seemingly urgent, ask yourself: What will happen if I don't do this, and is it worth putting off the important to do it? If you haven't already accomplished at least one important task in the day, don't spend the last business hour returning a DVD to avoid a $5 late charge. Get the important task done and pay the $5 fine.

7. **Put a Post-it on your computer screen or set an Outlook reminder to alert you at least three times daily with the question: Are you inventing things to do to avoid the important?**
I also use free time-tracking software called RescueTime (www.rescuetime.com) to alert me when I spend more than an allotted time on certain websites or programs often used to avoid the important (Gmail, Facebook, Outlook, etc.). It also summarizes your time use each week and compares your performance to peers.

8. **Do not multitask**.
I'm going to tell you what you already know. Trying to brush your teeth, talk on the phone, and answer e-mail at the same time just doesn't work. Eating while doing online research and instant messaging? Ditto.

If you prioritize properly, there is no need to multitask. It is a symptom of "task creep"—doing more to feel productive while actually accomplishing less. As stated, you should have, at most, two primary goals or tasks per day. Do them separately from start to finish without distraction. Divided attention will result in more frequent interruptions, lapses in concentration, poorer net results, and less gratification.

9. **Use Parkinson's Law on a Macro and Micro Level**.
Use Parkinson's Law to accomplish more in less time. Shorten schedules and deadlines to necessitate focused action instead of deliberation and procrastination.

On a weekly and daily macro level, attempt to take Monday and/or Friday off, as well as leave work at 4 P.M. This will focus you to prioritize more effectively and quite possibly develop a social life. If you're under the hawklike watch of a boss, we'll discuss the nuts and bolts of how to escape in later chapters.

On a micro task level, limit the number of items on your to-do list and use impossibly short deadlines to force immediate action while ignoring minutiae.

If doing work online or near an online computer, http://e.ggtimer.com/ is a convenient countdown timer. Just type the desired time limit directly into the URL field and hit enter. The http:// can often be omitted. For example:

http://e.ggtimer.com/5minutes (or just "e.ggtimer.com/5min"insomebrowsers)

http://e.ggtimer.com/1hour30minutes30seconds

http://e.ggtimer.com/30 (if you just put in a number, it assumes seconds)

► COMFORT CHALLENGE

Learn to Propose (2 Days)

Stop asking for opinions and start proposing solutions. Begin with the small things. If someone is going to ask, or asks, “Where should we eat?” “What movie should we watch?” “What should we do tonight?” or anything similar, do NOT reflect it back with, “Well, what do you want to … ?” *Offer a solution*. Stop the back-and-forth and make a decision. Practice this in both personal and professional environments. Here are a few lines that help (my favorites are the first and last):

“Can I make a suggestion?”

“I propose …”

“I’d like to propose …”

“I suggest that … What do you think?”

“Let’s try … and then try something else if that doesn’t work.”

► LIFESTYLE DESIGN IN ACTION

I’m a musician who got your book because Derek Sivers at CD Baby recommended it. Checking Pareto’s Law I realized that 78% of my downloads came from just one of my CDs and that 55% of my total download income came from only five songs! It showed me what my fans are looking for and allowed me to showcase those on my web site. Downloads are the way to go. iTunes sells the song and CD Baby direct deposits it to my account. Fully automated once the recording is done. There are some months I can live off download income. Once I finish paying off debt, it should be no problem to travel as an artist and create new fans all over the world and have a cyber income stream.

—VICTOR JOHNSON

• • •

As for “outsourcing” your banking, any company that needs to take checks (cheques) should consider a lock box solution. Just about any bank that does business banking offers it. All checks go to a PO box at the bank, the bank processes the checks and deposits them, and according to your instructions can send you a file of all the checks that are deposited. Normally this can be done in either a flat, Excel or other file type that can interface with any accounting systems from Excel, to Quicken to SAP. Quite cost effective.

—ANONYMOUS

❻

The Low-Information Diet

► CULTIVATING SELECTIVE IGNORANCE

> What information consumes is rather obvious: it consumes the attention of its recipients. Hence, a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.
>
> —HERBERT SIMON, recipient of Nobel Memorial Prize in Economics[8] and the A.M. Turing Award, the "Nobel Prize of Computer Science"

> Reading, after a certain age, diverts the mind too much from its creative pursuits. Any man who reads too much and uses his own brain too little falls into lazy habits of thinking.
>
> —ALBERT EINSTEIN

I hope you're sitting down. Take that sandwich out of your mouth so you don't choke. Cover the baby's ears. I'm going to tell you something that upsets a lot of people.

I never watch the news and have bought one single newspaper in the last five years, in Stansted Airport in London, and only because it gave me a discount on a Diet Pepsi.

I would claim to be Amish, but last time I checked, Pepsi wasn't on the menu.

How obscene! I call myself an informed and responsible citizen? How do I stay up-to-date with current affairs? I'll answer all of that, but wait—it gets better. I usually check business e-mail for about an hour each Monday, and I never check voicemail when abroad. Never ever.

But what if someone has an emergency? It doesn't happen. My contacts now know that I don't respond to emergencies, so the emergencies somehow don't exist or don't come to me. Problems, as a rule, solve themselves or disappear if you remove yourself as an information bottleneck and empower others.

Cultivating Selective Ignorance

> There are many things of which a wise man might wish to be ignorant.
>
> —RALPH WALDO EMERSON (1803–1882)

From this point forward, I'm going to propose that you develop an uncanny ability to be selectively ignorant. Ignorance may be bliss, but it is also practical. It is imperative that you learn to ignore or redirect all information and interruptions that are irrelevant, unimportant, or unactionable. Most are all three.

The first step is to develop and maintain a low-information diet. Just as modern man consumes both too many calories and calories of no nutritional value, information workers eat data both in excess and from the wrong sources.

Lifestyle design is based on massive action—output. Increased output necessitates decreased input. Most information is time-consuming, negative, irrelevant to your goals, and outside of your influence. I challenge you to look at whatever you read or watched today and tell me that it wasn't at least two of the four.

I read the front page headlines through the newspaper machines as I walk to lunch each day and nothing more. In five years, I haven't had a single problem due to this selective ignorance. It gives you something new to ask the rest of the population in lieu of small talk: "Tell me, what's new in the world?" And, if it's that important, you'll hear people talking about it. Using my crib notes approach to world affairs, I also retain more than someone who loses the forest for the trees in a sea of extraneous details.

From an actionable information standpoint, I consume a maximum of one-third of one industry magazine *(Response* magazine) and one business magazine *(Inc.)* per month, for a grand total of approximately four hours. That's it for results-oriented reading. I read an hour of fiction prior to bed for relaxation.

How on earth do I act responsibly? Let me give an example of how I and other **NR** both consider and obtain information. I voted in the last presidential election,[9] despite having been in Berlin. I made my decision in a matter of hours. First, I sent e-mails to educated friends in the U.S. who share my values and asked them who they were voting for and why. Second, I judge people based on actions and not words; thus, I asked friends in Berlin, who had more perspective outside of U.S. media propaganda, how they judged the candidates based on their historical behavior. Last, I watched the presidential debates. That was it. I let other dependable people synthesize hundreds of hours and thousands of pages of media for me. It was like having dozens of personal information assistants, and I didn't have to pay them a single cent.

That's a simple example, you say, but what if you need to learn to do something your friends haven't done? Like, say, sell a book to the world's largest publisher as a first-time author? Funny you should ask. There are two approaches I used:

1. I picked one book out of dozens based on reader reviews and the fact that the authors had actually done what I wanted to do. If the task is how-to in nature, I only read accounts that are "how I did it" and autobiographical. No speculators or wannabes are worth the time.

2. Using the book to generate intelligent and specific questions, I contacted 10 of the top authors and agents in the world via e-mail and phone, with a response rate of 80%.

I only read the sections of the book that were relevant to immediate next steps, which took less than two hours. To develop a template e-mail and call script took approximately four hours, and the actual e-mails and phone calls took less than an hour. This personal contact approach is not only more effective and more efficient than all-you-can-eat info buffets, it also provided me with the major league alliances and mentors necessary to sell this book. Rediscover the power of the forgotten skill called "talking." It works.

Once again, less is more.

How to Read 200% Faster in 10 Minutes

There will be times when, it's true, you will have to read. Here are four simple tips that will lessen the damage and increase your speed at least 200% in 10 minutes with no comprehension loss:

1. ***Two Minutes:* Use a pen or finger to trace under each line as you read as fast as possible**. Reading is a series of jumping snapshots (called saccades), and using a visual guide prevents regression.

2. *Three Minutes:* **Begin each line focusing on the third word in from the first word, and end each line focusing on the third word in from the last word**. This makes use of peripheral vision that is otherwise wasted on margins. For example, even when the highlighted words in the next line are your beginning and ending focal points, the entire sentence is "read," just with less eye movement:

"Once upon **a** time, an information addict **decided** to detox."

Move in from both sides further and further as it gets easier.

3. *Two Minutes:* **Once comfortable indenting three or four words from both sides, attempt to take only two snapshots—also known as fixations—per line on the first and last indented words**.

4. *Three Minutes:* **Practice reading too fast for comprehension but with good technique (the above three techniques) for five pages prior to reading at a comfortable speed**. This will heighten perception and reset your speed limit, much like how 50 mph normally feels fast but seems like slow motion if you drop down from 70 mph on the freeway.

To calculate reading speed in words per minute (wpm)—and thus progress—in a given book, add up the number of words in ten lines and divide by ten to get the average words per line. Multiply this by the number of lines per page and you have the average words per page. Now it's simple. If you initially read 1.25 pages in one minute at 330 average words per page, that's 412.5 words per minute. If you then read 3.5 pages after training, it's 1,155 words per minute and you're in the top 1% of the world's fastest readers.

► Q&A: QUESTIONS AND ACTIONS

> Learning to ignore things is one of the great paths to inner peace.
>
> —ROBERT J. SAWYER, *Calculating God*

1. **Go on an immediate one-week media fast**.

The world doesn't even hiccup, much less end, when you cut the information umbilical cord. To realize this, it's best to use the Band-Aid approach and do it quickly: a one-week media fast. Information is too much like ice cream to do otherwise. "Oh, I'll just have a half a spoonful" is about as realistic as "I just want to jump online for a minute." Go cold turkey.

If you want to go back to the 15,000-calorie potato chip information diet afterward, fine, but beginning tomorrow and for at least five full days, here are the rules:

No newspapers, magazines, audiobooks, or nonmusic radio. Music is permitted at all times.

No news websites whatsoever (cnn.com, drudgereport.com, msn.com,[10] etc.).

No television at all, except for one hour of pleasure viewing each evening.

No reading books, except for this book and one hour of *fiction*[11] pleasure reading prior to bed.

No web surfing at the desk unless it is necessary to complete a work task for *that day*. Necessary means necessary, not nice to have.

Unnecessary reading is public enemy number one during this one-week fast.

What do you do with all the extra time? Replace the newspaper at breakfast with speaking to your spouse, bonding with your children, or learning the principles in this book. Between 9–5, complete your top priorities as per the last chapter. If you complete them with time to spare, do the exercises in this book. Recommending this book might seem hypocritical, but it's not: The information in these pages is both important and to be applied now, not tomorrow or the day after.

Each day at lunch break, and no earlier, get your five-minute news fix. Ask a well-informed colleague or a restaurant waiter, "Anything important happening in the world today? I couldn't get the paper today." Stop this as soon as you realize that the answer doesn't affect your actions at all. Most people won't even remember what they spent one to two hours absorbing that morning.

Be strict with yourself. I can prescribe the medicine, but you need to take it.

Download the Firefox web browser (www.firefox.com) and use **LeechBlock** to block certain sites entirely for set periods. From their site (http://www.proginosko.com/leechblock.html):

> You can specify up to six sets of sites to block, with different times and days for each set. You can block sites within fixed time periods (e.g., between 9am and 5pm), after a time limit (e.g., 10 minutes in every hour), or with a combination of time periods and time limit (e.g., 10 minutes in every hour between 9am and 5pm). You can also set a password for access to the extension options, just to slow you down in moments of weakness!

2. **Develop the habit of asking yourself, "Will I definitely use this information for something immediate and important?"**

It's not enough to use information for "something"—it needs to be immediate and important. If "no" on either count, don't consume it. Information is useless if it is not applied to something important or if you will forget it before you have a chance to apply it.

I used to have the habit of reading a book or site to prepare for an event weeks or months in the future, and I would then need to reread the same material when the deadline for action was closer. This is stupid and redundant. Follow your to-do short list and fill in the information gaps as you go.

Focus on what digerati Kathy Sierra calls "just-in-time" information instead of "just-in-case" information.

3. **Practice the art of nonfinishing**.

This is another one that took me a long time to learn. Starting something doesn't automatically justify finishing it.

If you are reading an article that sucks, put it down and don't pick it back up. If you go to a movie and it's worse than *Matrix III*, get the hell out of there before more neurons die. If you're full after half a plate of ribs, put the damn fork down and don't order dessert.

More is not better, and stopping something is often 10 times better than finishing it. Develop the habit of nonfinishing that which is boring or unproductive if a boss isn't demanding it.

► COMFORT CHALLENGE

Get Phone Numbers (2 Days)

Being sure to maintain eye contact, ask for the phone numbers of at least two (the more you attempt, the less stressful it will be) attractive members of the opposite sex on each day. Girls, this means you're in the game as well, and it doesn't matter if you're 50+. Remember that the real goal is not to get numbers, but to get over the fear of asking, so the outcome is unimportant. If you're in a relationship, sign up to (or pretend to) gather information for Greenpeace. Just toss the numbers if you get them.

Go to a mall if you want to get some rapid-fire practice—my preference for getting over the discomfort quickly—and aim to ask three people in a row within five minutes. Feel free to use some variation of the following script:

"Excuse me. I know this is going to sound strange, but if I don't ask you now, I'll be kicking myself for the rest of the day. I'm running to meet a friend [i.e., I have friends and am not a stalker], but I think you're really [extremely, drop-dead] cute [gorgeous, hot]. Could I have your phone number? I'm not a psycho—I promise. You can give me a fake one if you're not interested."

---

8. Simon received the Nobel Prize in 1978 for his contribution to organizational decision making: It is impossible to have perfect and complete information at any given time to make a decision.

9. 2004 at the time this was written.

10. LOL.

11. As someone who read exclusively nonfiction for nearly 15 years, I can tell you two things: It's not productive to read two fact-based books at the same time (this is one), and fiction is better than sleeping pills for putting the happenings of the day behind you.

7

Interrupting Interruption and the Art of Refusal

> Do your own thinking independently. Be the chess player, not the chess piece.
>
> —RALPH CHARELL

> Meetings are an addictive, highly self-indulgent activity that corporations and other organizations habitually engage in only because they cannot actually masturbate.
>
> —DAVE BARRY, Pulitzer Prize–winning American humorist

SPRING 2000, PRINCETON , NEW JERSEY

1:35 P.M.

"I think I understand. Moving on. In the next paragraph, it explains that …" I had detailed notes and didn't want to miss a single point.

3:45 P.M.

"OK. That makes sense, but if we look at the following example …" I paused for a moment mid-sentence. The teaching assistant had both hands on his face.

"Tim, let's end here for now. I'll be sure to keep these points in mind." He had had enough. Me too, but I knew I'd only have to do it once.

For all four years of school, I had a policy. If I received anything less than an A on the first paper or non-multiple-choice test in a given class, I would bring 2–3 hours of questions to the grader's office hours and not leave until the other had answered them all or stopped out of exhaustion.

This served two important purposes:

1. I learned exactly how the grader evaluated work, including his or her prejudices and pet peeves.
2. The grader would think long and hard about ever giving me less than an A. He or she would never consider giving me a bad grade without exceptional reasons for doing so, as he or she knew I'd come a'knocking for another three-hour visit.

Learn to be difficult when it counts. In school as in life, having a reputation for being assertive will help you receive preferential treatment without having to beg or fight for it every time.

Think back to your days on the playground. There was always a big bully and countless victims, but there was also that one small kid who fought like hell, thrashing and swinging for the fences. He or she might not have won, but after one or two exhausting exchanges, the bully chose not to bother him or her. It was easier to find someone else.

Be that kid.

Doing the important and ignoring the trivial is hard because so much of the world seems to conspire to force crap upon you. Fortunately, a few simple routine changes make bothering you much more painful than leaving you in peace.

It's time to stop taking information abuse.

Not All Evils Are Created Equal

For our purposes, an interruption is anything that prevents the start-to-finish completion of a critical task, and there are three principal offenders:

1. **Time wasters:** those things that can be ignored with little or no consequence. Common time wasters include meetings, discussions, phone calls, web surfing, and e-mail that are *unimportant*.
2. **Time consumers:** repetitive tasks or requests that need to be completed but often interrupt high-level work. Here are a few you might know intimately: reading and responding to e-mail, making and returning phone calls, customer service (order status, product assistance, etc.), financial or sales reporting, personal errands, all necessary repeated actions and tasks.
3. **Empowerment failures:** instances where someone needs approval to make something small happen. Here are just a few: fixing customer problems (lost shipments, damaged shipments, malfunctions, etc.), customer contact, cash expenditures of all types.

Let's look at the prescriptions for all three in turn.

Time Wasters: Become an Ignoramus

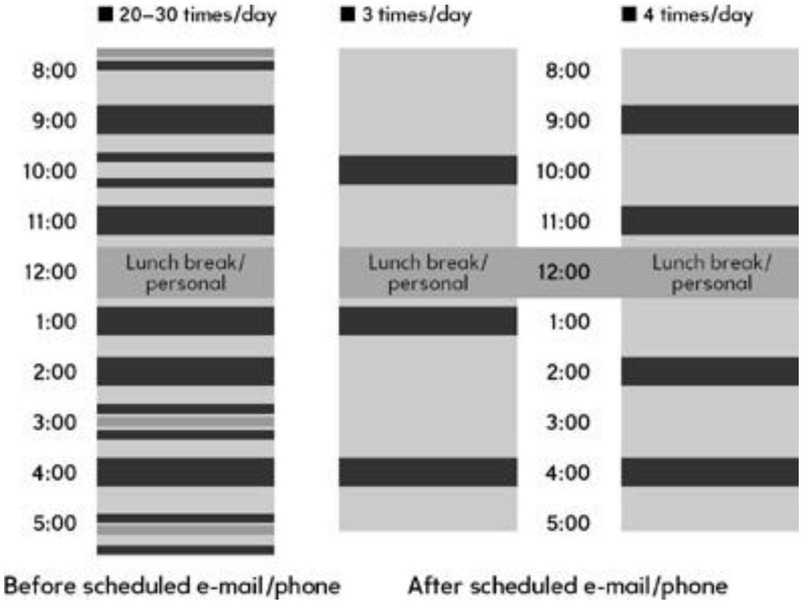
The best defense is a good offense.

—DAN GABLE, Olympic gold medalist in wrestling and the most successful coach in history; personal record: 299–6–3, with 182 pins

Time wasters are the easiest to eliminate and deflect. It is a matter of limiting access and funneling all communication toward immediate action.

First, limit e-mail consumption and production. This is the greatest single interruption in the modern world.

1. Turn off the audible alert if you have one on Outlook or a similar program and turn off automatic send/receive, which delivers e-mail to your inbox as soon as someone sends them.
2. Check e-mail twice per day, once at 12:00 noon or just prior to lunch, and again at 4:00 P.M. 12:00 P.M. and 4:00 P.M. are times that ensure you will have the most responses from previously sent e-mail. Never check e-mail first thing in the morning.[12] Instead, complete your most important task before 11:00 A.M. to avoid using lunch or reading e-mail as a postponement excuse.



LIGHT GRAY INDICATES TIME AVAILABLE FOR HIGH-PRIORITY TASKS . *Courtesy of SANDIA*

Before implementing the twice-daily routine, you must create an e-mail autoresponse that will train your boss, co-workers, suppliers, and clients to be more effective. I would recommend that you do not ask to implement this. Remember one of our ten commandments: Beg for forgiveness; don't ask for permission.

If this gives you heart palpitations, speak with your immediate supervisor and propose to trial the approach for one to three days. Cite pending projects and frustration with constant interruptions as the reasons. Feel free to blame it on spam or someone outside of the office.

Here is a simple e-mail template that can be used:

> Greetings, Friends [or Esteemed Colleagues],
>
> Due to high workload, I am currently checking and responding to e-mail twice daily at 12:00 p.m. ET [or your time zone] and 4:00 p.m. ET.
>
> If you require urgent assistance (please ensure it is urgent) that cannot wait until either 12:00 p.m. or 4:00 p.m., please contact me via phone at 555–555–5555.
>
> Thank you for understanding this move to more efficiency and effectiveness. It helps me accomplish more to serve you better.
>
> Sincerely,
>
> Tim Ferriss

MOVE TO ONCE-PER-DAY as quickly as possible. Emergencies are seldom that. People are poor judges of importance and inflate minutiae to fill time and feel important. This autoresponse is a tool that, far from decreasing collective effectiveness, forces people to re-evaluate their reason for interrupting you and helps them decrease meaningless and time-consuming contact.

I was initially terrified of missing important requests and inviting disaster, just as you might be upon reading this recommendation. Nothing happened. Give it a shot and work out the small bumps as you progress.

For an extreme example of a personal autoresponder that has never prompted a complaint and allowed me to check e-mail once per week, send an e-mail to template@fourhourworkweek.com. It has been revised over three years and works like a charm.

The second step is to screen incoming and limit outgoing phone calls.

1. Use two telephone numbers if possible—one office line (non urgent) and one cellular (urgent). This could also be two cell phones, or the non-urgent line could be an Internet phone number that routes calls to online voicemail (www.skype.com, for example).

Use the cell number in the e-mail autoresponse and answer it at all times unless it is an unknown caller or it is a call you don't want to answer. If in doubt, allow the call to go to voicemail and listen to the voicemail immediately afterward to gauge importance. If it can wait, let it wait. The offending parties have to learn to wait.

The office phone should be put on silent mode and allowed to go to voicemail at all times. The voicemail recording should sound familiar:

> You've reached the desk of Tim Ferriss.
>
> I am currently checking and responding to voicemail twice daily at 12:00 p.m. ET [or your time zone] and 4:00 p.m. ET.
>
> If you require assistance with a truly urgent matter that cannot wait until either 12:00 p.m. or 4:00 p.m., please contact me on my cell at 555–555–5555. Otherwise, please leave a message and I will return it at the next of those two times. Be sure to leave your e-mail address, as I am often able to respond faster that way.
>
> Thank you for understanding this move to more efficiency and effectiveness. It helps me accomplish more to serve you better.
>
> Have a wonderful day.

2. If someone does call your cell phone, it is presumably urgent and should be treated as such. Do not allow them to consume time otherwise. It's all in the greeting. Compare the following:

Jane (receiver)**:** Hello?
John (caller)**:** Hi, is this Jane?
Jane: This is Jane.
John: Hi, Jane, it's John.
Jane: Oh, hi, John. How are you? (or) Oh, hi, John. What's going on?

John will now digress and lead you into a conversation about nothing, from which you will have to recover and then fish out the ultimate purpose of the call. There is a better approach:

Jane: This is Jane speaking.
John: Hi, it's John.
Jane: Hi, John. I'm right in the middle of something. How can I help you out?

Potential continuation:

John: Oh, I can call back.
Jane: No, I have a minute. What can I do for you?

Don't encourage people to chitchat and don't let them chitchat. Get them to the point immediately. If they meander or try to postpone for a later undefined call, reel them in and get them to come to the point. If they go into a long description of a problem, cut in with, "[Name], sorry to interrupt, but I have a call in five minutes. What can I do to help out?" You might instead say, "[Name], sorry to interrupt, but I have a call in five minutes. Can you send me an e-mail?"

The third step is to master the art of refusal and avoiding meetings.

THE FIRST DAY our new Sales VP arrived at TrueSAN in 2001, he came into the all-company meeting and made an announcement in just about this many words: "I am not here to make friends. I have been hired to build a sales team and sell product, and that's what I intend to do. Thanks." So much for small talk.

He proceeded to deliver on his promise. The office socializers disliked him for his no-nonsense approach to communication, but everyone respected his time. He wasn't rude without reason, but he was direct and kept the people around him focused. Some didn't consider him charismatic, but no one considered him anything less than spectacularly effective.

I remember sitting down in his office for our first one-on-one meeting. Fresh off four years of rigorous academic training, I immediately jumped into explaining the prospect profiles, elaborate planning I'd developed, responses to date, and so forth and so on. I had spent at least two hours preparing to make this first impression a good one. He listened with a smile on his face for no more than two minutes and then held up a hand. I stopped. He laughed in a kind-hearted manner and said, "Tim, I don't want the story. Just tell me what we need to do."

Over the following weeks, he trained me to recognize when I was unfocused or focused on the wrong things, which meant anything that didn't move the top two or three clients one step closer to signing a purchase order. Our meetings were now no more than five minutes long.

From this moment forward, resolve to keep those around you focused and avoid all meetings, whether in person or remote, that do not have clear objectives. It is possible to do this tactfully, but expect that some time wasters will be offended the first few times their advances are rejected. Once it is clear that remaining on task is your policy and not subject to change, they will accept it and move on with life. Hard feelings pass. Don't suffer fools or you'll become one.

It is your job to train those around you to be effective and efficient. No one else will do it for you. Here are a few recommendations:

1. Decide that, given the non-urgent nature of most issues, you will steer people toward the following means of communication, in order of preference: e-mail, phone, and in-person meetings. If someone proposes a meeting, request an e-mail instead and then use the phone as your fallback offer if need be. Cite other immediately pending work tasks as the reason.

2. Respond to voicemail via e-mail whenever possible. This trains people to be concise. Help them develop the habit.

Similar to our opening greeting on the phone, e-mail communication should be streamlined to prevent needless back-and-forth. Thus, an e-mail with "Can you meet at 4:00 P.M.?" would become "Can you meet at 4:00 P.M.? If so If not, please advise three other times that work for you."

This "if … then" structure becomes more important as you check e-mail less often. Since I only check e-mail once a week, it is critical that no one needs a "what if?" answered or other information within seven days of a given e-mail I send. If I suspect that a manufacturing order hasn't arrived at the shipping facility, for example, I'll send an e-mail to my shipping facility manager along these lines: "Dear Susan … Has the new manufacturing shipment arrived? If so, please advise me on … If not, please contact John Doe at 555–5555 or via e-mail at john@doe.com (he is also CC'd) and advise on delivery date and tracking. John, if there are any issues with the shipment, please coordinate with Susan, reachable at 555–4444, who has the authority to make decisions up to $500 on my behalf. In case of emergency, call me on my cell phone, but I trust you two. Thanks." This prevents most follow-up questions, avoids two separate dialogues, and takes me out of the problem-solving equation.

Get into the habit of considering what "if … then" actions can be proposed in any e-mail where you ask a question.

3. Meetings should only be held to make decisions about a predefined situation, not to define the problem. If someone proposes that you meet with them or "set a time to talk on the phone," ask that person to send you an e-mail with an agenda to define the purpose:

> That sounds doable. So I can best prepare, can you please send me an e-mail with an agenda? That is, the topics and questions we'll need to address? That would be great. Thanks in advance.

Don't give them a chance to bail out. The "thanks in advance" before a retort increases your chances of getting the e-mail.

The e-mail medium forces people to define the desired outcome of a meeting or call. Nine times out of ten, a meeting is unnecessary and you can answer the questions, once defined, via e-mail. Impose this habit on others. I haven't had an in-person meeting for my business in more than five years and have had fewer than a dozen conference calls, all lasting less than 30 minutes.

4. Speaking of 30 minutes, if you absolutely cannot stop a meeting or call from happening, *define the end time*. Do not leave these discussions open-ended, and keep them short. If things are well-defined, decisions should not take more than 30 minutes. Cite other commitments at odd times to make them more believable (e.g., 3:20 vs. 3:30) and force people to focus instead of socializing, commiserating, and digressing. If you must join a meeting that is scheduled to last a long time or that is open-ended, inform the organizer that you would like permission to cover your portion first, as you have a commitment in 15 minutes. If you have to, feign an urgent phone call. Get the hell out of there and have someone else update you later. The other option is to be completely transparent and voice your opinion of how unnecessary the meeting is. If you choose this route, be prepared to face fire and offer alternatives.

5. The cubicle is your temple—don't permit casual visitors. Some suggest using a clear "do not disturb" sign of some type, but I have found that this is ignored unless you have an office. My approach was to put headphones on, even if I wasn't listening to anything. If someone approached me despite this discouragement, I would pretend to be on the phone. I'd put a finger to my lips, say something like, "I hear you," and then say into the mic, "Can you hold on a second?" Next, I'd turn to the invader and say, "Hi. What can I do for you?" I wouldn't let them "get back to me" but rather force the person to give me a five-second summary and then send me an e-mail if necessary.

If headphone games aren't your thing, the reflexive response to an invader should be the same as when answering the cell phone: "Hi, invader. I'm right in the middle of something. How can I be of help?" If it's not clear within 30 seconds, ask the person to send you an e-mail about the chosen issue; do not offer to send them an e-mail first: "I'll be happy to help, but I have to finish this first. Can you send me a quick e-mail to remind me?" If you still cannot deflect an invader, give the person a time limit on your availability, which can also be used for phone conversations: "OK, I only have two minutes before a call, but what's the situation and what can I do to help?"

6. Use the Puppy Dog Close to help your superiors and others develop the no-meeting habit. The Puppy Dog Close in sales is so named because it is based on the pet store sales approach: If someone likes a puppy but is hesitant to make the life-altering purchase, just offer to let them take the pup home and bring it back if they change their minds. Of course, the return seldom happens.

The Puppy Dog Close is invaluable whenever you face resistance to permanent changes. Get your foot in the door with a "let's just try it once" reversible trial.

Compare the following:

> "I think you'd love this puppy. It will forever add to your responsibilities until he dies 10 years from now. No more care-free vacations, and you'll finally get to pick up poop all over the city—what do you think?"

vs.

Now imagine walking up to your boss in the hallway and clapping a hand on her shoulder:

> "I'd like to go to the meeting, but I have a better idea. Let's never have another one, since all we do is waste time and not decide anything useful."

vs.

The second set of alternatives seem less permanent, and they're intended to appear so. Repeat this routine and ensure that you achieve more outside of the meeting than the attendees do within it, repeat the disappearing act as often as possible and cite improved productivity to convert this slowly into a permanent routine change.

Learn to imitate any good child: “Just this once! Please!!! I promise I’ll do X!” Parents fall for it because kids help adults to fool themselves. It works with bosses, suppliers, customers, and the rest of the world, too.

Use it, but don’t fall for it. If a boss asks for overtime “just this once,” he or she will expect it in the future.

Time Consumers: Batch and Do Not Falter

> A schedule defends from chaos and whim.
>
> —ANNIE DILLARD, winner of Pulitzer Prize in nonfiction, 1975

If you have never used a commercial printer before, the pricing and lead times could surprise you.

Let’s assume it costs $310 and takes one week to print 20 customized T-shirts with 4-color logos. How much and how long does it take to print 3 of the same T-shirt?

$310 and one week.

How is that possible? Simple—the setup charges don’t change. It costs the printer the same amount in materials for plate preparation ($150) and the same in labor to man the press itself ($100). The setup is the real time-consumer, and thus the job, despite its small size, needs to be scheduled just like the other, resulting in the same one-week delivery date. The lower economy of scale picks up the rest: The cost for 3 shirts is $20 per shirt **x** 3 shirts instead of $3 per shirt **x** 20 shirts.

The cost- and time-effective solution, therefore, is to wait until you have a larger order, an approach called “batching.” Batching is also the solution to our distracting but necessary **time consumers**, those repetitive tasks that interrupt the most important.

If you check mail and make bill payments five times a week, it might take 30 minutes per instance and you respond to a total of 20 letters in two and a half hours. If you do this once per week instead, it might take 60 minutes total and you still respond to a total of 20 letters. People do the former out of fear of emergencies. First, there are seldom real emergencies. Second, of the urgent communication you will receive, missing a deadline is usually reversible and otherwise costs a minimum to correct.

There is an inescapable setup time for all tasks, large or minuscule in scale. It is often the same for one as it is for a hundred. There is a psychological switching of gears that can require up to 45 minutes to resume a major task that has been interrupted. More than a quarter of each 9–5 period (28%) is consumed by such interruptions.[13]

This is true of all recurring tasks and is precisely why we have already decided to check e-mail and phone calls twice per day at *specific predetermined times* (between which we let them accumulate).

From mid-2004 to 2007, I checked mail no more than once a week, often not for up to four weeks at a time. Nothing was irreparable, and nothing cost more than $300 to fix. This batching has saved me hundreds of hours of redundant work. How much is your time worth?

Let’s use a hypothetical example:

1. $20 per hour is how much you are paid or value your time. This would be the case, for example, if you

are paid $40,000 per year and get two weeks of vacation per year ($40,000 divided by [40 hours per week **x** 50 = 2,000] = $20/hour). Estimate your hourly income by cutting the last three zeroes off of your annual income and halving the remaining number (e.g., $50,000/year p $25/hour.

2. Estimate the amount of time you will save by grouping similar tasks together and batching them, and calculate how much you have earned by multiplying this hour number by your per-hour rate ($20 here):

1 × per week:	10 hours = $200
1 × per two weeks:	20 hours = $400
1 × per month:	40 hours = $800

3. Test each of the above batching frequencies and determine how much problems cost to fix in each period. If the cost is less than the above dollar amounts, batch even further apart.

For example, using our above math, if I check e-mail once per week and that results in an average loss of two sales per week, totaling $80 in lost profit, I will continue checking once per week because $200 (10 hours of time) minus $80 is still a $120 net gain, not to mention the enormous benefits of completing other main tasks in those 10 hours. If you calculate the financial and emotional benefit of completing just one main task (such as landing a major client or completing a life-changing trip), the value of batching is much more than the per-hour savings.

If the problems cost more than hours saved, scale back to the next-less-frequent batch schedule. In this case, I would drop from once per week to twice per week (not daily) and attempt to fix the system so that I can return to once per week. Do not work harder when the solution is working smarter. I have batched both personal and business tasks further and further apart as I've realized just how few real problems come up. Some of my scheduled batches in 2007 were e-mail (Mondays 10:00 A.M.), phone (completely eliminated), laundry (every other Sunday at 10:00 P.M.), credit cards and bills (most are on automatic payment, but I check balances every second Monday after e-mail), strength training (every 4th day for 30 minutes), etc.

Empowerment Failure: Rules and Readjustment

> The vision is really about empowering workers, giving them all the information about what's going on so they can do a lot more than they've done in the past.
>
> —BILL GATES, cofounder of Microsoft, richest man in the world

Empowerment failure refers to being unable to accomplish a task without first obtaining permission or information. It is often a case of being micromanaged or micromanaging someone else, both of which consume *your* time.

For the employee, the goal is to have full access to necessary information and as much independent decision-making ability as possible. For the entrepreneur, the goal is to grant as much information and independent decision-making ability to employees or contractors as possible.

Customer service is often the epitome of empowerment failure, and a personal example from BrainQUICKEN illustrates just how serious but easily solved the problem can be.

In 2002, I had outsourced customer service for order tracking and returns but still handled product-related questions myself. The result? I received more than 200 e-mail per day, spending all hours between 9–5 responding to them, and the volume was growing at a rate of more than 10% per week! I had to cancel advertising and limit shipments, as additional customer service would have been the final nail in the coffin. It wasn't *a scalable* model. Remember this word, as it will be important later. It wasn't scalable because there was an information and decision bottleneck: me.

The clincher? The bulk of the e-mail that landed in my inbox was not product-related at all but requests from the outsourced customer service reps seeking permission for different actions:

The customer claims he didn't receive the shipment. What should we do?

The customer had a bottle held at customs. Can we reship to a U.S. address?

The customer needs the product for a competition in two days. Can we ship overnight, and if so, how much should we charge?

It was endless. Hundreds upon hundreds of different situations made it impractical to write a manual, and I didn't have the time or experience to do so regardless.

Fortunately, someone did have the experience: the outsourced reps themselves. I sent one single e-mail to all the supervisors that immediately turned 200 e-mail per day into fewer than 20 e-mail per week:

> Hi All,
>
> I would like to establish a new policy for my account that overrides all others.
>
> Keep the customer happy. If it is a problem that takes less than $100 to fix, use your judgment and fix it yourself.
>
> This is official written permission and a request to fix all problems that cost under $100 without contacting me. I am no longer your customer; my customers are your customer. Don't ask me for permission. Do what you think is right, and we'll make adjustments as we go along.
>
> Thank you,
>
> Tim

Upon close analysis, it became clear that more than 90% of the issues that prompted e-mail could be resolved for less than $20. I reviewed the financial results of their independent decision-making on a weekly basis for four weeks, then a monthly basis, and then on a quarterly basis.

It's amazing how someone's IQ seems to double as soon as you give them responsibility and indicate that you trust them. The first month cost perhaps $200 more than if I had been micromanaging. In the meantime, I saved more than 100 hours of my own time per month, customers received faster service, returns dropped to less than 3% (the industry average is 10–15%), and outsourcers spent less time on my account, all of which resulted in rapid growth, higher profit margins, and happier people on all sides.

People are smarter than you think. Give them a chance to prove themselves.

If you are a micromanaged employee, have a heart-to-heart with your boss and explain that you want to be more productive and interrupt him or her less. "I hate that I have to interrupt you so much and pull you away from more important things I know you have on your plate. I was doing some reading and had some thoughts on how I might be more productive. Do you have a second?"

Before this conversation, develop a number of "rules" like the previous example that would allow you to work more autonomously with less approval-seeking. The boss can review the outcome of your decisions on a daily or weekly basis in the initial stages. Suggest a one-week trial and end with "I'd like to try it. Does that sound like something we could try for a week?" or my personal favorite, "Is that reasonable?" It's hard for people to label things unreasonable.

Realize that bosses are supervisors, not slave masters. Establish yourself as a consistent challenger of the status quo and most people will learn to avoid challenging you, particularly if it is in the interest of higher per-hour productivity.

If you are a micromanaging entrepreneur, realize that even if you can do something better than the rest of the world, it doesn't mean that's what you should be doing if it's part of the minutiae. Empower others to act without interrupting you.

SET THE RULES in your favor: Limit access to your time, force people to define their requests before spending time with them, and batch routine menial tasks to prevent postponement of more important projects. Do not let people interrupt you. Find your focus and you'll find your lifestyle.

The bottom line is that you only have the rights you fight for.

In the next section, **Automation**, we'll see how the New Rich create management-free money and eliminate the largest remaining obstacle of all: themselves.

► Q&A: QUESTIONS AND ACTIONS

> People think it must be fun to be a super genius, but they don't realize how hard it is to put up with all the idiots in the world.
>
> —CALVIN, from Calvin and Hobbes

Blaming idiots for interruptions is like blaming clowns for scaring children—they can't help it. It's their nature. Then again, I had (who am I kidding—and have), on occasion, been known to create interruptions out of thin air. If you're anything like me, that makes us both occasional idiots. Learn to recognize and fight the interruption impulse.

This is infinitely easier when you have a set of rules, responses, and routines to follow. It is your job to prevent yourself and others from letting the unnecessary and unimportant prevent the start-to-finish completion of the important.

This chapter differs from the previous in that the necessary actions, due to the inclusion of examples and templates, have been presented throughout from start to finish. This Q & A will thus be a summary rather than a repetition. The devil is in the details, so be sure to reread this chapter for the specifics.

The 50,000-foot review is as follows:

1. **Create systems to limit your availability via e-mail and phone and deflect inappropriate contact**. Get the autoresponse and voicemail script in place now, and master the various methods of evasion. Replace the habit of "How are you?" with "How can I help you?" Get specific and remember—no stories. Focus on immediate actions. Set and practice interruption-killing policies.

Avoid meetings whenever possible:

- ► Use e-mail instead of face-to-face meetings to solve problems.
- ► Beg-off going (this can be accomplished through the Puppy Dog

Close).

- If meetings are unavoidable, keep the following in mind:

- ► Go in with a clear set of objectives.

- ► Set an end time or leave early.

2. **Batch activities to limit setup cost and provide more time for dreamline milestones**.
What can I routinize by batching? That is, what tasks (whether laundry, groceries, mail, payments, or sales reporting, for example) can I allot to a specific time each day, week, month, quarter, or year so that I don't squander time repeating them more often than is absolutely necessary?

3. **Set or request autonomous rules and guidelines with occasional review of results**.
Eliminate the decision bottleneck for all things that are nonfatal if misperformed. If an employee, believe in yourself enough to ask for more independence on a trial basis. Have practical "rules" prepared and ask the boss for the sale after surprising him or her with an impromptu presentation. Remember the Puppy Dog Close—make it a one-time trial and reversible.

For the entrepreneur or manager, give others the chance to prove themselves. The likelihood of irreversible or expensive problems is minimal and the time savings are guaranteed. Remember, profit is only profitable to the extent that you can use it. For that you need time.

► TOOLS AND TRICKS

Eliminating Paper Distractions, Capturing Everything

► Evernote (www.evernote.com)

This is perhaps the most impressive tool I've found in the last year, introduced to me by some of the most productive technologists in the world. Evernote has eliminated more than 90% of the paper in my life and eliminated nearly all of the multiple tabs I used to leave open in web browsers, both of which distracted me to no end. It can clear out your entire office clutter in one to three hours.

Evernote allows you to easily capture information from anywhere using whatever device is at hand, and everything is then searchable (read: findable) from anywhere. I use it to:

- ► Take photographs of everything I might want to remember or find later—business cards, handwritten notes, wine labels, receipts, whiteboard sessions, and more. Evernote identifies the text in all of these pictures automatically, so it's all searchable(!), whether from an iPhone, your laptop, or the web. Just as one example, I can store and find the contact information from any business card in seconds (often using the built in iSight camera on Mac to capture it), rather than spending hours inputting it all into contacts or searching through e-mail for that lost phone number. It’s mind-numbing how much time this saves.

- ► Scan all agreements, paper articles, etc., that would otherwise sit in file folders or on my desk. I use the Mac Fujitsu ScanSnap miniscanner (http://bit.ly/scansnapmac), the best I’ve found, which scans all of it directly to Evernote in seconds with one button.

- ► Take snapshots of websites, capturing all text and links, so that I can read them offline when traveling or doing later research. Get rid of all those scattered bookmarks, favorites, and open tabs.

Screening and Avoiding Unwanted Calls

►**GrandCentral (www.grandcentral.com)** and **YouMail (www.youmail.com)**

In a world where your physical address will change more often than your cell phone number (and e-mail), it can be disastrous if your number becomes public or gets in the wrong hands. Enter GrandCentral, which will give you a number with the area code of your choosing that then forwards to your own phone(s). I now give a GrandCentral number to anyone besides family and close friends. Some of the benefits:

- ► Identify any incoming number as unwanted, and that caller will then hear a “number not in service” message when attempting to call you.

- ► Customize your voicemail message to individual callers (spouse, boss, colleague, client, etc.) and listen in on messages as they’re being left, so you can “pick up” if the message is worth the interruption. Call recording is also an option.

- ► Use an area code outside of your hometown to prevent people and companies from finding and misusing addresses you’d prefer to keep private.

- ► Establish do-not-disturb hours, when calls are routed directly to voicemail with no ring.

- ► Have voicemail sent to your cell phone as SMS (text messages).

YouMail, another option, can also transcribe voicemails and send them to your phone as text messages. Getting calls while stuck in a time-wasting meeting? No problem: Respond to voicemails via SMS during the meeting so you're not stuck returning calls afterward.

One Shot, One Kill Scheduling Without E-mail Back-and-Forth

Few things are as time-consuming as scheduling via e-mail. Person A: "How about Tues. at 3 P.M.?" Person B: "I can make it." Person C: "I have a meeting. How about Thurs.?" Person D: "I'm on a con-call. How about 10 A.M. on Fri.?" Use these tools to make scheduling simple and fast instead of another part-time job.

► Doodle (www.doodle.com)

The best free tool I've found for herding cats (multiple people) for scheduling without excessive e-mail. Create and poll in 30 seconds with the proposed options and forward a link to everyone invited. Check back a few hours later and you'll have the best time for the most people.

► TimeDriver (www.timedriver.com)

Let colleagues and clients self-schedule with you based on your availability, which is determined by integration with Outlook or Google Calendar. Embed a "schedule now" button in e-mail messages and you'll never have to tell people when you can make a call or meeting. Let them see what's open and choose.

Choosing the Best E-mail Batching Times

► Xobni (www.xobni.com/special)

Xobni—*inbox* spelled backwards—is a free program for putting Outlook on steroids. It offers many features, but the most relevant to this chapter is its ability to identify "hotspots," or periods of time when you receive the bulk of e-mail from your most important contacts. These "hotspots" are batching times that will enable you to keep critical contacts (clients, bosses, etc.) smiling even while you reduce checking e-mail to 1–3 times per day. It will also populate your contacts automatically by pulling phone numbers, addresses, etc., from separate e-mail buried in the inbox.

E-mailing Without Entering the Black Hole of the Inbox

Don't enter the black hole of the inbox off hours because you're afraid you'll forget something. Use these services instead to keep focused, whether on completing a critical project or simply enjoying the weekend.

► **Jott (www.jott.com)**

Capture thoughts, create to-do's, and set reminders with a simple toll-free phone call. The service transcribes your message (15–30 seconds) and e-mails it to whomever you want, including yourself, or to your Google calendar for automatic scheduling. Jott also enables you to post voice message links to Twitter (www.twitter.com), Facebook (www.facebook.com), and other services that tend to consume hours if you visit the sites themselves.

► **Copy talk (www.copytalk.com)**

Dictate any message up to four minutes and have the transcription e-mailed to you within hours. Excellent for brainstorming, and the accuracy is astounding.

Preventing Web Browsing Completely

► **Freedom (http://www.ibiblio.org/fred/freedom/)**

Freedom is a free application that disables networking on an Apple computer for 1–480 mintues (up to eight hours) at a time. Freedom will free you from the distractions of the Internet, allowing you the focus to get real work done.

Freedom enforces freedom; a reboot is the only method for turning Freedom off before the time limit you've set for yourself. The hassle of rebooting means you're less likely to cheat, and you'll be more productive. Experiment with the software for short periods of time at first (30–60 minutes.)

► COMFORT CHALLENGE

Revisit the Terrible Twos (2 Days)

For the next two days, do as all good two-year-olds do and say "no" to all requests. Don't be selective. Refuse to do all things that won't get you immediately fired. Be selfish. As with the last exercise, the objective isn't an outcome—in this case, eliminating just those things that waste time—but the process: getting comfortable with saying "no." Potential questions to decline include the following:

Do you have a minute?

Want to see a movie tonight/tomorrow?

Can you help me with X?

"No" should be your default answer to all requests. Don't make up elaborate lies or you'll get called on them. A simple "I really can't—sorry; I've got too much on my plate right now" will do as a catch-all response.

► LIFESTYLE DESIGN IN ACTION

Batching tool—PO Box: This might be stating the obvious, but one easy way to encourage batching of your mail is to use a PO Box versus getting mail delivered to your house. We got our PO Box to limit access to our physical address online, but it also encourages you to get the mail less and deal with it in batch. Our post office has recycling bins, so at least 60% of the mail doesn't even come home with us. For a while I was only getting and managing the mail once a week, and I found not only did it take less time overall, I did a better job managing it and getting it out of the way versus looking at it and setting it aside for future follow up.

—LAURA TURNER

• • •

For families, the four-hour workweek doesn't have to mean four months on a sailboat in the Caribbean unless that's their dream, but even the simple ideal of having time to take a walk in the park every evening or spending weekends together, makes taking actions to implement this program worthwhile.

[There are many different approaches for making this work]: Kids have to promise they won't bother Mommy in the evening while she works on the computer, the husband watches the kids in the evening, both parents make plans once a week to have someone take care of the kids, etc. Then close with the huge payoff for the family of having more time to spend with each other.

—ADRIENNE JENKINS

• • •

Why not combine a mini-retirement with dentistry (or medical) geoarbitrage and finance your trip with the savings? I lived in Thailand for four months and got root canal treatment and a crown for ⅓ of the price that it costs in Australia. There are many upmarket clinics set up for "expats" and health travelers in Thailand, Philippines, Vietnam, Goa, etc., with English-speaking dentists. And in Europe many people go to Poland or Hungary. To research, just Google "dentist" and the country and you will come across practices advertising to foreigners. Talk to expats when you're in the country or on online chat forums for recommendations. Now I'm in Australia I still combine my travels with annual dentist checkups—and the savings often finance my airfare. Even between developed countries there are significant cost differences. For example France is far cheaper than the UK and Australia is cheaper than the U.S. [Note from Tim: Learn more about the incredible world of medical tourism and geoarbitrage at http://en.wikipedia.org/wiki/Medical_tourism. Even large insurers like AETNA often cover overseas treatments and surgeries.]

—ANONYMOUS

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12. This habit alone can change your life. It seems small but has an enormous effect.

13. Jonathan B. Spira and Joshua B. Feintuch, *The Cost of Not Paying Attention: How Interruptions*

Impact Knowledge Worker Productivity (Basex, 2005).

Step III:
A is for Automation

SCOTTY: She's all yours, sir. All systems automated and ready. A chimpanzee and two trainees could run her!
CAPTAIN KIRK: Thank you, Mr. Scott. I'll try not to take that personally .

— *STAR TREK*

8

Outsourcing Life

► OFF-LOADING THE REST AND A TASTE OF GEOARBITRAGE [14]

A man is rich in proportion to the number of things he can afford to let alone.

—HENRY DAVID THOREAU, naturalist

If I told you this story, you wouldn't believe me, so I'll let AJ tell it. It will set the stage for even more incredible things to come, all of which you will do yourself.

My Outsourced Life

A true account by AJ Jacobs, editor-at-large at *Esquire* magazine (ellipses represent passage of time between entries)

IT BEGAN a month ago. I was midway through *The World Is Flat*, the bestseller by Tom Friedman. I like Friedman, despite his puzzling decision to wear a mustache. His book is all about how outsourcing to India and China is not just for tech support and carmakers but is poised to transform every industry in America, from law to banking to accounting.

I don't have a corporation; I don't even have an up-to-date business card. I'm a writer and editor working from home, usually in my boxer shorts or, if I'm feeling formal, my penguin-themed pajama bottoms. Then again, I think, why should Fortune 500 firms have all the fun? Why can't I join in on the biggest business trend of the new century? Why can't I outsource my low-end tasks? Why can't I outsource my life?

The next day I e-mail Brickwork, one of the companies Friedman mentions in his book. Brickwork—based in Bangalore, India—offers "remote executive assistants," mostly to financial firms and healthcare companies that want data processed. I explain that I'd like to hire someone to help with *Esquire-related* tasks—doing research, formatting memos, like that. The company's CEO, Vivek Kulkarni, responds, "It would be a great pleasure to be talking to a person of your stature." Already I'm liking this. I've never had stature before. In America, I barely command respect from a Bennigan's maître d', so it's nice to know that in India I have stature.

A couple of days later, I get an e-mail from my new "remote executive assistant."

> Dear Jacobs,
>
> My name is Honey K. Balani. I would be assisting you in your editorial and personal job.... I would try to adapt myself as per your requirements that would lead to desired satisfaction.

Desired satisfaction. This is great. Back when I worked at an office, I had assistants, but there was never any talk of *desired satisfaction*. In fact, if anyone ever used the phrase "desired satisfaction," we'd all end up in a solemn meeting with HR.

• • •

I GO OUT to dinner with my friend Misha, who grew up in India, founded a software firm, and subsequently became nauseatingly rich. I tell him about Operation Outsource. "You should call Your Man in India," he says. Misha explains that this is a company for Indian businessmen who have moved overseas but who still have parents back in New Delhi or Mumbai. YMII is their overseas concierge service—it buys movie tickets and cell phones and other sundries for abandoned moms.

Perfect. This could kick my outsourcing up to a new level. I can have a nice, clean division of labor: Honey will take care of my business affairs, and YMII can attend to my personal life—pay my bills, make vacation reservations, buy stuff online. Happily, YMII likes the idea, and just like that the support team at Jacobs Inc. has doubled.

• • •

HONEY HAS completed her first project for me: research on the person *Esquire* has chosen as the Sexiest Woman Alive. I've been assigned to write a profile of this woman, and I really don't want to have to slog through all the heavy-breathing fan websites about her. When I open Honey's file, I have this reaction: America is f*cked. There are charts. There are section headers. There is a well-organized breakdown of her pets, measurements, and favorite foods (e.g., swordfish). If all Bangalorians are like Honey, I pity Americans about to graduate college. They're up against a hungry, polite, Excel-proficient Indian army.

* * *

IN FACT, in the next few days, I outsource a whole mess of online errands to Asha (from the personal service YMII): paying my bills, getting stuff from drugstore.com, finding my son a Tickle Me Elmo. (Actually, the store was out of Tickle Me Elmos, so Asha bought a Chicken Dance Elmo—good decision.) I had her call Cingular to ask about my cell-phone plan. I'm just guessing, but I bet her call was routed from Bangalore to New Jersey and then back to a Cingular employee in Bangalore, which makes me happy for some reason.

* * *

IT'S THE fourth morning of my new, farmed-out life, and when I flip on my computer, my e-mail inbox is already filled with updates from my overseas aides. It's a strange feeling having people work for you while you sleep. Strange, but great. I'm not wasting time while I drool on my pillow; things are getting done.

* * *

HONEY IS my protector. Consider this: For some reason, the Colorado Tourism Board e-mails me all the time. (Most recently, they informed me about a festival in Colorado Springs featuring the world's most famous harlequin.) I request that Honey gently ask them to stop with the press releases. Here's what she sent:

> Dear All,
>
> Jacobs often receives mails from Colorado news, too often. They are definitely interesting topics. However, these topics are not suitable for "Esquire."
>
> Further, we do understand that you have taken a lot of initiatives working on these articles and sending it to us. We understand. Unfortunately, these articles and mails are too time consuming to be read.
>
> Currently, these mails are not serving right purpose for both of us. Thus, we request to stop sending these mails.
>
> We do not mean to demean your research work by this.
>
> We hope you understand too.
>
> Thanking you,
>
> Honey K B

That is the best rejection notice in journalism history. It's exceedingly polite, but there's a little undercurrent of indignation. Honey seems almost outraged that Colorado would waste the valuable time of Jacobs.

* * *

I DECIDE to test the next logical relationship: my marriage. These arguments with my wife are killing me—partly because Julie is a much better debater than I am. Maybe Asha can do better:

> Hello Asha,
>
> My wife got annoyed at me because I forgot to get cash at the automatic bank machine … I wonder if you could tell her that I love her, but gently remind her that she too forgets things—she has lost her wallet twice in the last month. And she forgot to buy nail clippers for Jasper.
>
> AJ

I can't tell you what a thrill I got from sending that note. It's pretty hard to get much more passive-aggressive than bickering with your wife via an e-mail from a subcontinent halfway around the world.

The next morning, Asha CC'd me on the e-mail she sent to Julie.

> Julie,
>
> Do understand your anger that I forgot to pick up the cash at the automatic machine. I have been forgetful and I am sorry about that.
>
> But I guess that doesn't change the fact that I love you so much….
>
> Love
> AJ
>
> P. S. This is Asha mailing on behalf of Mr. Jacobs.

As if that weren't enough, she also sent Julie an e-card. I click on it: two teddy bears embracing, with the words, "Anytime you need a hug, I've got one for you…. I'm sorry."

Damn! My outsourcers are too friggin' nice! They kept the apology part but took out my little jabs. They are trying to save me from myself. They are superegoing my id. I feel castrated.

Julie, on the other hand, seems quite pleased: "That's nice, sweetie. I forgive you."

* * *

DESPITE THREE weeks with my support team, I'm still stressed. Perhaps it's the fault of Chicken Dance Elmo, whom my son loves to the point of dry humping, but who is driving me slowly insane. Whatever the reason, I figure it's time to conquer another frontier: outsourcing my inner life.

First, I try to delegate my therapy. My plan is to give Asha a list of my neuroses and a childhood anecdote or two, have her talk to my shrink for 50 minutes, then relay the advice. Smart, right? My shrink refused. Ethics or something. Fine. Instead, I have Asha send me a meticulously researched memo on stress relief. It had a nice Indian flavor to it, with a couple of yogic postures and some visualization.

This was okay, but it didn't seem quite enough. I decided I needed to outsource my worry. For the last few weeks I've been tearing my hair out because a business deal is taking far too long to close. I asked Honey if she would be interested in tearing her hair out in my stead. Just for a few minutes a day. She thought it was a wonderful idea. "I will worry about this every day," she wrote. "Do not worry."

The outsourcing of my neuroses was one of the most successful experiments of the month. Every time I started to ruminate, I'd remind myself that Honey was already on the case, and I'd relax. No joke—this alone was worth it.

At a Glance: Where You Will Be

> The future is here. It's just not widely distributed yet.
>
> —WILLIAM GIBSON, author of *Neuromancer;* coined term "cyberspace" in 1984

Here is a sneak preview of full automation.

I woke up this morning, and given that it's Monday, I checked my e-mail for one hour after an exquisite Buenos Aires breakfast.

Sowmya from India had found a long-lost high school classmate of mine, and Anakool from YMII had put together Excel research reports for retiree happiness and the average annual hours worked in different fields. Interviews for this week had been set by a third Indian virtual assistant, who had also found contact information for the best Kendo schools in Japan and the top salsa teachers in Cuba. In the next e-mail folder, I was pleased to see that my fulfillment account manager in Tennessee, Beth, had resolved nearly two dozen problems in the last week—keeping our largest clients in China and South Africa smiling—and had also coordinated California sales tax filing with my accountants in Michigan. The taxes had been paid via my credit card on file, and a quick glance at my bank accounts confirmed that Shane and the rest of the team at my credit card processor were depositing more cash than last month. All was right in the world of automation.

It was a beautiful sunny day, and I closed my laptop with a smile. For an all-you-can-eat buffet breakfast with coffee and orange juice, I paid $4 U.S. The Indian outsourcers cost between $4–10 U.S. per hour. My domestic outsourcers are paid on performance or when product ships. This creates a curious business phenomenon: Negative cash flow is impossible.

Fun things happen when you earn dollars, live on pesos, and compensate in rupees, but that's just the beginning.

But I'm an Employee! How Does This Help Me?

> Nobody can give you freedom. Nobody can give you equality or justice or anything. If you're a man, you take it.
>
> —MALCOLM X, *Malcolm X Speaks*

Getting a remote personal assistant is a huge departure point and marks the moment that you learn how to give orders and be commander instead of the commanded. It is small-scale training wheels for the most critical of **NR** skills: remote management and communication.

It is time to learn how to be the boss. It isn't time-consuming. It's low-cost and it's low-risk. Whether or not you "need" someone at this point is immaterial. It is an exercise.

It is also a litmus test for entrepreneurship: Can you manage (direct and chastise) other people? Given the proper instruction and practice, I believe so. Most entrepreneurs fail because they jump into the deep end of the pool without learning to swim first. Using a virtual assistant (VA) as a simple exercise with no downside, the basics of management are covered in a 2–4-week test costing between $100–400. This is an investment, not an expense, and the ROI is astounding. It will be repaid in a maximum of 10–14 days, after which it is pure timesaving profit.

Becoming a member of the NR is not just about working smarter. It's about building a system to replace yourself.

This is the first exercise.

Even if you have no intention of becoming an entrepreneur, this is the ultimate continuation of our 80/20 and elimination process: Preparing someone to replace you (even if it never happens) will produce an ultrarefined set of rules that will cut remaining fat and redundancy from your schedule. Lingering unimportant tasks will disappear as soon as someone else is being paid to do them.

But what about the cost?

This is a hurdle that is hard for most. If I can do it better than an assistant, why should I pay them at all? *Because the goal is to free your time to focus on bigger and better things*.

This chapter is a low-cost exercise to get you past this lifestyle limiter. It is absolutely necessary that you realize that you can always do something more cheaply yourself. This doesn't mean you want to spend your time doing it. If you spend your time, worth $20–25 per hour, doing something that someone else will do for $10 per hour, it's simply a poor use of resources. It is important to take baby steps toward paying others to do work for you. Few do it, which is another reason so few people have their ideal lifestyles.

Even if the cost is occasionally more per hour than you currently earn, the trade is often worth it. Let's assume you make $50,000 and thus $25 per hour (working from 9–5, Monday through Friday, for 50 weeks per year). If you pay a top-notch assistant $30 per hour and he or she saves you one full 8-hour shift per week, your cost (subtracting what you're being paid) is $40 to free an extra day. Would you pay $40 per week to work Monday to Thursday? I would, and I do. Keep in mind that this is a worst-case cost scenario.

But what if your boss freaks out?

It's largely a non-issue, and prevention is better than cure. There is no ethical or legal reason for the boss to know if you choose non-sensitive tasks. The first option is to assign personal items. Time is time, and if you're spending time on chores and errands that could be spent better elsewhere, a VA will improve life and the management learning curve is similar. Second, you can delegate business tasks that don't include financial information or identify your company.

Ready to build an army of assistants? Let's first look at the dark side of delegation. A review is in order to prevent abuses of power and wasteful behavior.

Delegation Dangers: Before Getting Started

> The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency.
>
> —BILL GATES

Have you ever been given illogical assignments, handed unimportant work, or commanded to do something in the most inefficient fashion possible? Not fun and not productive.

Now it's your turn to show that you know better. Delegation is to be used as a further step in reduction, not as an excuse to create more movement and add the unimportant. Remember—unless something is well-defined and important, no one should do it.

Eliminate before you delegate.

Never automate something that can be eliminated, and never delegate something that can be automated or streamlined. Otherwise, you waste someone else's time instead of your own, which now wastes your hard-earned cash. How's that for incentive to be effective and efficient? Now you're playing with your own dough. It's something I want you to get comfortable with, and this baby step is small stakes.

Did I mention to eliminate before you delegate?

For example, it is popular among executives to have assistants read e-mail. In some cases this is valuable. In my case, I use spam filters, autoresponders with FAQs, and automatic forwarding to outsourcers to limit my e-mail obligation to 10–20 e-mail responses per week. It takes me 30 minutes per week because I used systems—elimination and automation—to make it so.

Nor do I use an assistant to set meetings and conference calls because I have eliminated meetings. If I need to set the odd 20-minute call for a given month, I'll send one two-sentence e-mail and be done with it.

Principle number one is to refine rules and processes before adding people. Using people to leverage a refined process multiplies production; using people as a solution to a poor process multiplies problems.

The Menu: A World of Possibilities

> I am not interested in picking up crumbs of compassion thrown from the table of someone who considers himself my master. I want the full menu of rights.
>
> —BISHOP DESMOND TUTU, South African cleric and activist

The next question then becomes, "What should you delegate?" It's a good question, but I don't want to answer it. I want to watch *Family Guy*.

The truth be told, it is a hell of a lot of work writing about not working. Ritika of Brickwork and Venky of YMII are more than capable of writing this section, so I'll just mention two guidelines and leave the mental hernia of detail work to them.

Golden Rule #1: Each delegated task must be both time-consuming *and well-defined*. If you're running around like a chicken with its head cut off and assign your VA to do that for you, it doesn't improve the order of the universe.

Golden Rule #2: On a lighter note, have some fun with it. Have someone in Bangalore or Shanghai send e-mails to friends as your personal concierge to set lunch dates or similar basics. Harass your boss with odd phone calls in strong accents from unknown numbers. Being effective doesn't mean being serious all the time. It's fun being in control for a change. Get a bit of repression off your chest so it doesn't turn into a complex later.

Getting Personal and Going Howard Hughes

Howard Hughes, the ultrarich filmmaker and eccentric from *The Aviator*, was notorious for assigning odd tasks to his assistants. Here are a few from Donald Bartlett's *Howard Hughes: His Life and Madness you* might want to consider.

1. After his first plane crash, Hughes confided in a friend that he believed his recovery was due to his

consumption of orange juice and its healing properties. He believed that exposure to the air diluted the juice's potency, so he demanded that fresh oranges be sliced and juiced in front of him.

2. When Hughes was partaking of the nightlife in Las Vegas, his aides were charged with approaching any girls he took a liking to. If a girl was invited to join the Hughes table and agreed, an aide would pull out a waiver and agreement for her to sign.

3. Hughes had a barber on call 24/7 but had his hair and nails trimmed about once a year.

4. In his hotel-bound years, Hughes was rumored to have instructed assistants to place a single cheeseburger in a specific tree outside his penthouse room at a 4:00 P.M. each day, whether he was there or not.

Such a world of possibilities! Just as the Model-T brought transportation to the masses, virtual assistants bring eccentric billionaire behavior within reach of each man, woman, and child. Now, that's progress.

Without further ado, let me pass the mic. Note that YMII performs both personal and business tasks, whereas Brickwork focuses solely on business projects. Let's start with the important but dull stuff and move quickly from the sublime to the ridiculous. To give a true taste of what to expect, I have not corrected non-native-sounding English.

Venky: Don't limit yourself. Just ask us if something is possible. We've arranged parties, organized caterers, researched summer courses, cleaned up accounting books, created 3D drafts based on blueprints. Just ask us. We could find the closest kid-friendly restaurant to your house for your son's birthday, finding out costs and organizing the birthday party. This frees up your time to work or hang out with your son.

What can we not do? We can't do anything that would require our physical presence. But you would be surprised as to how small a set of tasks that is in this day and age.

Here are the most common tasks we handle:

► scheduling interviews and meetings ► web-research ► following up on appointments, errands, and tasks ► online purchases ► creation of legal documents ► website maintenance (web design, publishing, uploading files) that doesn't require a professional designer ► monitoring, editing, and publishing comments for online discussions ► posting job vacancies on the web ► document creation ► proofreading and editing documents for spelling and formatting ► online research for updating blogs ► updating the database for Customer Relationship Management Software ► managing recruitment processes ► updating invoices and receiving payments ► voicemail transcription

Ritika at Brickwork added the following:

► market research ► financial research ► business plans ► industry analysis ► market assessment reports ► preparing presentations ► reports and newsletters ► legal research ► analytics ► website development ► search engine optimization ► maintaining and updating databases ► credit scoring ► managing procurement processes

Venky: We have a forgetful client who has us call him all the time with various reminders. One of our clients on a custom plan has us wake him up every morning. We've done the legwork and found people who fell out of contact after Katrina. Found jobs for clients! My favorite so far: One of our clients has a pair of trousers that he really likes that aren't in production anymore. He's sending them to Bangalore (from London) to have created exact replicas at a tiny fraction of the price.

Here are a few other YMII custom requests:

- ► Reminding an overzealous client to pay his current parking fines, as well as not speed and collect parking fines.
- ► Apologizing and sending flowers and cards to spouses of clients.
- ► Charting a diet plan, reminding client on it regularly, ordering groceries based on the specific diet plan.
- ► Getting a job for a person who lost his job due to outsourcing a year back. We did the job search, did the cover letters, did the resume tuning, and got the client a job in 30 days.
- ► Fixing a broken windowpane of a house in Geneva, Switzerland.
- ► Collecting homework information from teacher's voicemail and e-mailing it to the client (parents of the kid).
- ► Research on how to tie a shoelace meant for a kid (client's son).

- ► Find a parking slot for your car in some other city even before you make the trip.

- ► Ordered garbage bins for home.

- ► Get an authenticated weather forecast and weather report for a particular time in a particular place on a particular day, five years ago. This was to be used as supportive evidence for a lawsuit.

- ► Talking to parents in our client's stead.

Here's another real example of personal outsourcing from reader David Cross, who got a personal chef at home for less than $5 per meal. Just thinking of the possibilities is enough to make you start drooling. He explains:

I wanted to find someone to prepare food I love. I trained as a chef but I am often so busy and as I am the only one in the house who really cooks, I often don't have time to prepare the food that makes me feel the healthiest so I wrote the attached ad and dropped it on Craigslist.

This was a very tight focus—ultraspecific—I had just two applicants in two months—one who was a 2/10 match but the guy we just OK'd was a Hare Krishna follower for many years, lived in India, and his sample menu proved he knew what he's doing so we just started him.

The food is absolutely awesome. The hourly rate is *extremely reasonable,* he's a five-minute detour when either of us are in town to collect food and I now have delicious Indian food for less than $5 a meal and it's as good as anything I've ever eaten anywhere.

I'm going to progress to other cuisines now… Thai, Italian, Chinese, etc., and it means when I do have time to cook I'll enjoy doing it that much more as I am not the only one cooking!

Indian/Asian Vegetarian Cook Needed

Date: 2007–06–07, 12:25PM PDT

Hello.

We are a local, international family who love Indian and Asian vegetarian food. We are looking for a cook experienced in this wonderful cuisine to prepare delicious, fresh, healthy, authentic Indian/Asian vegetarian meals for us.

If you've cooked a curry once or twice or need to follow recipes, this position is probably not for you,

> Indian vegetarian food then we'd like to hear from you. This could be an ideal opportunity if you are Indian, Pakistani, Punjabi, etc., and are looking for a great way to apply your experience and love of Indian vegetarian food, cooking and culture. Knowledge of Ayurved and how this relates to food and diet is a plus though not essential.
>
> Please reply with details of your experience and some dishes you could prepare. If we like what you have to offer, we'll arrange for you to cook a sample meal or two which we will pay you for and then we'll see what works out for us all.
>
> This is a part-time position. You will be self-employed and responsible for your own taxes, etc. We'll pay you an hourly rate we will agree with you plus grocery bills for the food you prepare. You can prepare food in your own place and we can arrange to collect it from you, possibly for us to freeze for later eating. We will work with you to come up with menus and schedules that work out for you and us.
>
> Thank you for your interest.

Basic Choices: New Delhi or New York?

There are tens of thousands of VAs—how on earth do you find the right one? The resources at the end of this chapter will show you where to look, but it is overwhelming and confusing unless you have a few criteria determined in advance.

It often helps to begin with the question "Where on Earth?"

Remote or Local?

"Made in the USA" doesn't have the ring it used to. The pros of jumping time zones and visiting third-world currency are twofold: People work while you sleep, and the per-hour expense is less. Time savings and cost savings. Ritika explains the former with an example.

One can give the remote personal assistant in India their assignment when they are leaving work at the end of the day in New York City, and they will have the presentation ready the next morning. Because of the time difference with India, assistants can work on it while they are asleep and have it back in their morning. When they wake up, they will find the completed summary in their inbox. These assistants can also help them keep pace with what they want to read, for example.

Indian and Chinese VAs, as well as most from other developing countries, will run $4–15 per hour, the lower end being limited to simple tasks and the higher end including the equivalent of Harvard or Stanford M.B.A.s and Ph.D.s. Need a business plan to raise funding? Brickwork can provide it for between $2,500–5,000 instead of $15,000–20,000. Foreign assistance isn't just for the small time. I know from firsthand discussions that executives from big five accounting and management consulting firms routinely charge clients six figures for research reports that are then farmed to India for low four figures.

Bangalore 100%? It's not. The important metric is cost per completed task, not cost per hour.

The biggest challenge with overseas help will be the language barrier, which often quadruples back-and-forth discussion and the ultimate cost. The first time I hired an Indian VA, I made the fundamental mistake of not setting an hour cap for three simple tasks. I checked in later that week and found he had spent 23 hours chasing his tail. He had scheduled one tentative interview for the following week, set at the wrong time! Mind boggling. 23 hours? It ended up costing me, at $10 per hour, $230. The same tasks, assigned later that week to a native English speaker in Canada, were completed in two hours at $25 per hour. $50 for more than four times the results. That said, I later requested another Indian VA from the same firm who was able to duplicate the native speaker results.

How do you know which to choose? That's the beautiful part: You don't. It's a matter of testing a few assistants to both sharpen your communication skills and determine who is worth hiring and who is worth firing. Being a results-based boss isn't as simple as it looks.

There are a number of lessons to be learned here.

First, per-hour cost is not the ultimate determinant of cost. Look at per-task cost. If you need to spend time restating the task and otherwise managing the VA, determine the time required of you and add this (using your per-hour rate from earlier chapters) to the end sticker price of the task. It can be surprising. As cool as it is to say that you have people working for you in three countries, it's uncool to spend time babysitting people who are supposed to make your life easier.

Second, the proof is in the pudding. It is impossible to predict how well you will work with a given VA without a trial. Luckily, there are things you can do to improve your odds, and one of them is using a VA firm instead of a solo operator.

Solo vs. Support Team

Let's suppose you find the perfect VA. He or she is performing all of your noncritical tasks and you've decided to take a much-deserved vacation to Thailand. It's nice to know someone besides you will be manning the wheel and putting out fires for a change. Finally, some relief! Two hours before your flight from Bangkok to Phuket, you receive an e-mail: Your VA is out of commission and will be in the hospital for the next week. Not good. Vacation FUBAR.

I don't like being dependent on one person, and I don't recommend it in the least. In the world of high technology, this type of dependency would be referred to as a "single point of failure"—one fragile item upon which all else depends. In the world of IT,[15] the term "redundancy" is used as a selling point for systems that continue to function if there is a malfunction or mechanical failure in any given part. In the context of VAs, redundancy entails having fallback support.

I recommend that you hire a VA firm or VAs with backup teams instead of sole operators. Examples abound, of course, of people who have had a single assistant for decades without incident, but I suggest that this is the exception rather than the rule. Better safe than sorry. Besides simple disaster avoidance, a group structure provides a pool of talent that allows you to assign multiple tasks without bothering to find a new person with the qualifications. Brickwork and YMII both exemplify this type of structure and provide a single point of contact, a personal account manager, who then farms out your tasks to the most-capable people in the group and across different shifts. Need graphic design? Covered. Need database management? Covered. I don't like calling and coordinating multiple people. I want one-stop shopping and am willing to pay 10% more to have it. I encourage you to be similarly pound-wise and penny-foolish.

Team preference doesn't mean that bigger is better, just that multiple people are better than one person. The best VA I have used to date is an Indian with five backup assistants under him. Three can be more than sufficient, but two is toeing the line.

The #1 Fear: “Sweetheart, Did You Buy a Porsche in China?”

I’m sure you might have your fears. AJ certainly did:

My outsourcers now know an alarming amount about me—not just my schedule but my cholesterol, my infertility problems, my Social Security number, my passwords (including the one that is a particularly adolescent curse word). Sometimes I worry that I can’t piss off my outsourcers or I’ll end up with a $12,000 charge on my MasterCard bill from the Louis Vuitton in Anantapur.

The good news is that misuse of financial and confidential information is rare. In all of the interviews I conducted for this section, I could find only one case of information abuse, and I had to search long and hard. It involved an overworked U.S.-based VA who hired freelance help at the last moment.

Commit to memory the following—never use the new hire. Prohibit small-operation VAs from subcontracting work to untested freelancers without your written permission. The more established and higher-end firms, Brickwork in the below example, have security measures that border on excessive and make it simple to pinpoint abusers in the case of a breach:

- ► Employees undergo background checks and sign NDAs (nondisclosure agreements) in accordance with the company policy of maintaining confidentiality of client information
- ► Electronic access card for entry and exit
- ► Credit card information keyed only by select supervisors
- ► Removal of paper from the offices is prohibited
- ► VLAN-based access restrictions between different teams; this ensures that there is no unauthorized access of information between people of different teams in the organization
- ► Regular reporting on printer logs

- ► Floppy drives and USB ports disabled

- ► BS779 certification for accomplished international security standards

- ► 128-bit encryption technology for all data exchange

- ► Secure VPN connection

I bet there is a fair chance that sensitive data is 100 times safer with Brickwork than on your own computer.

Still, information theft is best thought of as inevitable in a digital world, and precautions should be taken with damage control in mind. There are two rules that I use to minimize damage and allow for fast repair.

1. Never use debit cards for online transactions or with remote assistants. Reversing unauthorized credit card charges, particularly with American Express, is painless and near instantaneous. Recovering funds withdrawn from your checking account via unauthorized debit card use takes dozens of hours in paperwork alone and can take months to receive, if approved at all.
2. If your VA will be accessing websites on your behalf, create a new unique login and password to be used on those sites. Most of us reuse both logins and passwords on multiple sites, and taking this precaution limits possible damage. Instruct them to use these unique logins to create accounts on new sites if needed. Note that this is particularly important when using assistants who have access to live commercial websites (developers, programmers, etc.).

If information or identity theft hasn't hit you, it will. Use these guidelines and you'll realize when it happens that, just like most nightmares, it's not that big a deal and is reversible.

The Complicated Art of Simplicity:
Common Complaints

My assistant is an idiot! It took him 23 hours to book an interview! This was the first complaint I had, for sure. 23 hours! I was heated up for a shouting match. My original e-mail to this first assistant seemed clear enough.

Dear Abdul,

Here are the first tasks, due at the end of next Tuesday. Please call or e-mail with any questions:

1. Go to this article http://www.msnbc.msn.com/id/12666060/site/newsweek/, get the phone/e-mail/website contacts for Carol Milligan and Marc and Julie Szekely. Also find the same info for Rob Long here http://www.msnbc.msn.com/id/12652789/site/newsweek/.

(username: notreal, password: donttryit) to book them in my calendar for next week any time between 9–9 ET.

3. Find the name, e-mail, and phone (phone is least important) of workers in the U.S. who have negotiated remote work agreements (telecommuting) despite resistant bosses. Those who have traveled outside the U.S. are ideal. Other keywords could include "teleworking" and "telecommuting." The important factor is that they negotiated with difficult bosses. Please send me links to their profiles or write a paragraph describing why they fit the profile above.

Look forward to seeing what you can do. Please e-mail if you don't understand or have questions.

Best,
Tim

The truth is—I was at fault. This is not a good debut demand, and I made fatal mistakes even before composing it. If you are an effective person but unaccustomed to issuing commands, assume that most problems at the outset are your fault. It is tempting to immediately point the finger at someone else and huff and puff, but most beginner bosses repeat the same mistakes I made.

1. I accepted the first person the firm provided and made no special requests at the outset.

Request someone who has "excellent" English and indicate that phone calls will be required (even if not). Be fast to request a replacement if there are repeated communication issues.

2. I gave imprecise directions.

I asked him to schedule interviews but didn't indicate that it was for an article. He assumed, based on work with previous clients, that I wanted to hire someone and he misspent time compiling spreadsheets and combing online job sites for additional information I didn't need.

Sentences should have one possible interpretation and be suitable for a 2nd-grade reading level. This goes for native speakers as well and will make requests clearer. Ten-dollar words disguise imprecision.

Note that I asked him to respond *if* he didn't understand or had questions. This is the wrong approach. Ask foreign VAs to rephrase tasks to confirm understanding before getting started.

3. I gave him a license to waste time.

This brings us again to damage control. Request a status update after a few hours of work on a task to ensure that the task is both understood and achievable. Some tasks are, after initial attempts, impossible.

4. I set the deadline a week in advance.

Use Parkinson's Law and assign tasks that are to be completed within no more than 72 hours. I have had the best luck with 48 and 24 hours. This is another compelling reason to use a small group (three or more) rather than a single individual who can become overtaxed with last-minute requests from multiple clients. Using short deadlines does not mean avoiding larger tasks (e.g., business plan), but rather breaking them into smaller milestones that can be completed in shorter time frames (outline, competitive research summaries, chapters, etc.).

5. I gave him too many tasks and didn't set an order of importance.

I advise sending one task at a time whenever possible and no more than two. If you want to cause your computer to hang or crash, open 20 windows and applications at the same time. If you want to do the

Eliminate before you delegate.

WHAT DOES A good VA task e-mail look like? The following example was recently sent to an Indian VA whose results have been nothing short of spectacular:

> Dear Sowmya,
>
> Thank you. I would like to start with the following task.
>
> TASK: I need to find the names and e-mails of editors of men's magazines in the US (for example: maxim, stuff, GQ, esquire, blender, etc.) who also have written books. An example of such a person would be AJ Jacobs who is Editor-at-Large of Esquire (www.ajjacobs.com). I already have his information and need more like him.
>
> Can you do this? If not, please advise. **Please reply and confirm what you will plan to do to complete this task**.
>
> DEADLINE: Since I'm in a rush, get started after your next e-mail and stop at 3 hours and tell me what results you have. Please begin this task now if possible. The deadline for these 3 hours and reported results is end-of-day ET Monday.
>
> Thank you for your fastest reply,
>
> Tim

Short, sweet, and to the point. Clear writing, and therefore clear commands, come from clear thinking. Think simple.

• • •

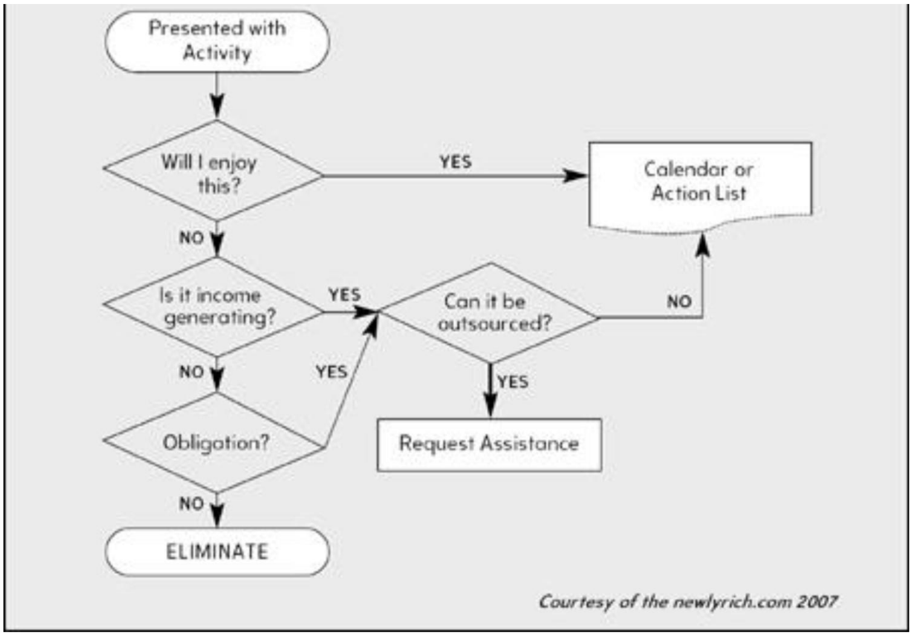
IN THE NEXT several chapters, the communication skills you develop with our virtual assistant experiment will be applied to a much larger and obscenely profitable playing field: automation. The extent to which you will outsource next makes delegation look like finger painting.

In the world of automation, not all business models are created equal. How do you assemble a business and coordinate all its parts without lifting a finger? How do you automate cash deposits in your bank account while avoiding the most common problems? It begins with understanding the options, the art of dodging information flow, and what we will call "muses."

The next chapter is a blueprint for the first step: a product.

Go with the Flow

Here is a flowchart of 4HWW from reader Jed Wood, who has used it for faster decision making, more output with less input, and more time with his wife and children.


Presented with Activity
Will I enjoy this?
YES
Calendar or Action List
NO
Is it income generating?
YES
Can it be outsourced?
NO
NO
YES
YES
Obligation?
Request Assistance
NO
ELIMINATE

Courtesy of the newlyrich.com 2007

► Q&A: QUESTIONS AND ACTIONS

1. **Get an assistant—even if you don't need one**.
Develop the comfort of commanding and not being commanded. Begin with a one-time test project or small repetitive task (daily preferred). I advise using domestic help for language-intensive tasks and using foreign assistants in the early stages to improve the general clarity of your communication. Pick one from each group and get started.

The following sites, split up geographically, are useful resources.

U.S. and Canada ($20/hour+)

http://www.iavoa.com (International Association of Virtual Office Assistants). Global directory that includes the U.S.

http://www.cvac.ca (Canadian Virtual Assistant Connection)

http://www.canadianva.net/files/va-locator.html (Canada)

www.onlinebusinessmanager.com

North America and International ($4/hour+)

www.elance.com (Search "virtual assistants," "personal assistants," and "executive assistants.") The client feedback reviews on Elance enabled me to find my best VA to date, who costs $4/hour. Similar marketplaces with positive reviews include www.guru.com and www.rentacoder.com.

India

www.tryasksunday.com ($20–60 per month for 24/7 concierge, free one-week trial). AskSunday is one of the sophisticated new kids on the personal outsourcing block. Their site was nominated the #2 website of the year in 2007 by *Time* magazine. Just dial a 212 (NYC) area code and get routed to well-spoken assistants in India and the Philippines. I use this service 80% of the time, as most tasks take less than 10 minues to complete. For longer projects, there are teams available for $12/hour.

www.b2kcorp.com ($15/hour+) From Fortune 10 oil companies and Fortune 500 clients to Big 5 accounting firms and U.S. congressmen, Brickwork can handle it all. This is reflected in the costs of this pure suit-and-tie operation—business only. No flowers for auntie.

www.taskseveryday.com ($6.98/hour for a dedicated virtual assistant) Based in Mumbai, available via phone and e-mail from the U.S., UK, and Australia. Must choose between 20 or 40 hours per week and pre-purchase hours.

www.yourmaninindia.com ($6.25/hour+) YMII handles both business and personal tasks and can work with you in real time (there are people on duty 24/7) and complete work while you sleep. English capability and effectiveness vary tremendously across VAs, so interview yours before getting started or assigning important tasks. Important: Following the publication of the first edition of this book, there have been some complaints of lower quality and up to four-week wait lists to become a client.

2. **Start small but think big**.

Tina Forsyth, an online business manager (higher-level VA) who helps six-figure-income clients achieve seven figures with business model redesigns, makes the following recommendations.

- ► Look at your to-do list—what has been sitting on it the longest?
- ► Each time you are interrupted or change tasks, ask, “Could a VA do this?”
- ► Examine pain points—what causes you the most frustration and boredom?

Here are a few common time-consumers in small businesses with online presences.

- ► Submitting articles to drive traffic to site and build mailing lists
- ► Participating in or moderating discussion forums and message boards
- ► Managing affiliate programs
- ► Creating content for and publishing newsletters and blog postings

- ► Background research components of new marketing initiatives or analysis of current marketing results

Don’t expect miracles from a single VA, but don’t expect too little, either. Let go of the controls a bit. Don’t assign crap tasks that end up consuming rather than saving time. It makes little sense to spend 10–15 minutes sending an e-mail to India to get a price quote on a plane ticket when you could do the same online in 10 minutes and avoid all the subsequent back-and-forth.

Push outside your comfort zone—that is the entire point of the exercise.

It is always possible to reclaim a task for yourself if the VA proves incapable, so test the limits of their capabilities. Remember Brickwork’s suggestion: Don’t limit yourself.

3. **Identify your top five time-consuming non-work tasks and five personal tasks you could assign for sheer fun**.

4. **Keep in sync: scheduling and calendars**.
If you decide to have an assistant schedule appointments and add things to your calendar, it will be important to ensure what you both see is updated. There are several options:

BusySync (www.busysync.com) I have two Gmail accounts: one private account for me and one for my assistant, where general e-mail is sent. I use BusySync to synchronize her Google Calendar with iCal (Mac calendar) on my laptop. I have also used **SpanningSync** (www.spanningsync.com) successfully for the same purpose.

WebEx Office (www.weboffice.com) Share your calendar online while masking personal appointments. Can be synchronized with Outlook, and also offers document sharing and other assistant- or team-friendly features. I suggest you compare this to synchronizing your Outlook with an assistant’s Google Calendar.

► COMFORT CHALLENGE

Use the Criticism Sandwich (2 Days and Weekly)

Chances are good that someone—be it a co-worker, boss, customer, or significant other—does something irritating or at a subpar level. Rather than avoid the topic out of fear of confrontation, let’s chocolate-coat it and ask them to fix it. Once per day for two days, and then each Thursday (M-W is too tense and Friday is too relaxed) for the next three weeks, resolve to use what I call the Criticism Sandwich with someone. It’s called the Criticism Sandwich because you first *praise* the person for something, then *deliver the criticism*, and then close with topic-shifting *praise* to exit the sensitive topic. Here’s an example with a superior or boss, with keywords and phrases in italics.

You: Hi, Mara. Do you have a second?

Mara: Sure. What’s up?

You: *First, I wanted to thank you for* helping me with the Meelie Worm account [or whatever]. *I really appreciate* you showing me how to handle that. *You’re really good at* fixing the technical issues.

Mara: No problem.

You: *Here’s the thing.*[16] There is a lot of work coming down on everyone, and *I’m feeling*[17] a bit overwhelmed. *Normally, priorities are really clear to me*[18] but I’ve been having trouble recently figuring out which tasks are highest on the list. *Could you help me by* pointing out the most important items when a handful need to be done? *I'm sure it's just me,*[19] *but I'd really appreciate it, and I think it would help.*

Mara: Uhh … I'll see what I can do.

You: *That means a lot to me. Thanks. Before I forget,*[20] last week's presentation was excellent.

Mara: Did you think so? Blah, blah, blah …

► LIFESTYLE DESIGN IN ACTION

THE BEST TIMES TO SEND E-MAIL

You've suggested people check e-mail only a few times a day. Here's a twist: I reply to e-mails when it's convenient, but I time it to arrive when it's also convenient for me. In Outlook you can delay e-mail delivery to any time of day. For example, when I return e-mails at 3 p.m., I don't want my staff instantly zinging me responses or clarifying questions. (This also prevents e-mail chats.) So I hit send, but it's delayed to arrive later in the evening or at 8 A.M. when my employees arrive the next day. This is how e-mail was meant to be! It's mail, not a chat service.

—***JIM LARRANAGA***

14. To leverage global pricing and currency differences for profit or lifestyle purposes.

15. Information technology.

16. Don't call it a problem if you can avoid it.

17. No one can argue with your feelings, so use this to avoid a debate about external circumstances.

18. Notice how I take "you" out of the sentence to avoid finger-pointing, even though it's implicit. "Normally, you make priorities clear" sounds like a backhanded insult. If this is a significant other, you can skip this formality, but never use "you always do X," which is just a fight starter.

19. Take a little bit of the heat off with this. The point has already been made.

20. "Before I forget" is a great segue to the closing compliment, which is also a topic shifter and gets you off the sensitive topic without awkwardness.

❾

Income Autopilot I

► FINDING THE MUSE

> Just set it and forget it.
>
> —RON POPEIL, founder of RONCO; responsible for more than $1 billion in sales of rotisserie chicken roasters

> As to methods there may be a million and then some, but principles are few. The man who grasps principles can successfully select his own methods. The man who tries methods, ignoring principles, is sure to have trouble.
>
> —RALPH WALDO EMERSON

The Renaissance Minimalist

Douglas Price was waking up to another beautiful summer morning in his Brooklyn brownstone. First things first: coffee. The jet lag was minor, considering he had just returned from a two-week jaunt through the islands of Croatia. It was just one of six countries he had visited in the last 12 months. Japan was next on the agenda.

Buzzing with a smile and his coffee mug in hand, he ambled over to his Mac to check on personal e-mail first. There were 32 messages and all brought good news.

One of his friends and business partners, also a cofounder of Limewire, had an update: Last Bamboo, their start-up poised to reinvent peer-to-peer technology, was rounding the final corners of development. It could be their billion-dollar baby, but Doug was letting the engineers run wild first.

Samson Projects, one of the hottest contemporary art galleries in Boston, had compliments for Doug's latest work and requests for expanded involvement with new exhibits as their sound curator.

The last e-mail in his inbox was a fan letter addressed to "Demon Doc" and praise for his latest instrumental hip-hop album, *onliness v1.0.1*. Doug had released his album as what he termed "open source music"—anyone could download the album for free and use sounds from any track in his or her own compositions.

He smiled again, polished off his dark roast, and opened a window to deal with business e-mail next. It would take much less time. In fact, less than 30 minutes for the day and 2 hours for the week.

How much things change.

Two years earlier, in June of 2004, I was in Doug's apartment checking e-mail for what I hoped would be the last time for a long time. I was headed to JFK Airport in New York in a matter of hours and was preparing for an indefinite quest around the world. Doug looked on with amusement. He had similar plans for himself and was finally extricating himself from a venture-funded Internet startup that had once been a cover story and his passion but was now just a job. The euphoria of the dot-com era was long dead, along with most chances for a sale or an IPO.

He bid me farewell and made a decision as the taxi pulled from the curb—enough of the complicated stuff. It was time to return to basics.

Prosoundeffects.com, launched in January of 2005 after one week of sales testing on eBay, was designed to do one thing: give Doug lots of cash with minimal time investment.

This brings us back to his business inbox in 2006.

There are 10 orders for sound libraries, CDs that film producers, musicians, video game designers, and other audio professionals use to add hard-to-find sounds—whether the purr of a lemur or an exotic instrument—to their own creations. These are Doug's products, but he doesn't own them, as that would one revenue stream:

1. A prospective customer sees his Pay-Per-Click (PPC) advertising on Google or other search engines and clicks through to his site, www.prosoundeffects.com.
2. The prospect orders a product for $325 (the average purchase price, though prices range from $29–7,500) on a Yahoo shopping cart, and a PDF with all their billing and shipping information is automatically e-mailed to Doug.
3. Three times a week, Doug presses a single button in the Yahoo management page to charge all his customers' credit cards and put cash in his bank account. Then he saves the PDFs as Excel purchase orders and e-mails the purchase orders to the manufacturers of the CD libraries. Those companies mail the products to Doug's customers—this is called drop-shipping—and Doug pays the manufacturers as little as 45% of the retail price of the products up to 90 days later (net-90 terms).

Let's look at the mathematical beauty of his system for full effect.

For each $325 order at his cost of 55% off retail, Doug is entitled to $178.75. If we subtract 1% of the full retail price (1% of $325 = $3.25) for the Yahoo Store transaction fee and 2.5% for the credit card processing fee (2.5% of $325 = $8.13), Doug is left with a pretax profit of $167.38 for this one sale.

Multiply this by 10 and we have $1673.80 in profit for 30 minutes of work. Doug is making $3,347.60 per hour and purchases no product in advance. His initial start-up costs were $1,200 for the webpage design, which he recouped in the first week. His PPC advertising costs approximately $700 per month and he pays Yahoo $99 per month for their hosting and shopping cart.

He works less than two hours a week, often pulls more than $10,000 per month, and there is no financial risk whatsoever.

Now Doug spends his time making music, traveling, and exploring new businesses for excitement. Prosoundeffects.com is not his end-all-be-all, but it has removed all financial concerns and freed his mind to focus on other things.

What would you do if you didn't have to think about money? If you follow the advice in this chapter, you will soon have to answer this question.

It's time to find your muse.

THERE ARE A million and one ways to make a million dollars. From franchising to freelance consulting, the list is endless. Fortunately, most of them are unsuited to our purpose. This chapter is not for people who want to *run* businesses but for those who want to *own* businesses and spend no time on them.

The response I get when I introduce this concept is more or less universal: Huh?

People can't believe that most of the ultrasuccessful companies in the world do not manufacture their own products, answer their own phones, ship their own products, or service their own customers. There are hundreds of companies that exist to pretend to work for someone else and handle these functions, providing rentable infrastructure to anyone who knows where to find them.

Think Microsoft manufactures the Xbox 360 or that Kodak designs and distributes their digital cameras? Guess again. Flextronics, a Singapore-based engineering and manufacturing firm with locations in 30 countries and $15.3 billion in annual revenue, does both. Most popular brands of mountain bikes in the U.S. are all manufactured in the same three or four plants in China. Dozens of call centers press one button to answer calls for the JC Penneys of the world, another to answer calls for the Dell Computers of the world, and yet another to answer calls for the New Rich like me.

It's all beautifully transparent and cheap.

Before we create this virtual architecture, however, we need a *product* to sell. If you own a service business, this section will help you convert expertise into a downloadable or shippable good to escape the limits of a per-hour-based model. If starting from scratch, ignore service businesses for now, as constant customer contact makes absence difficult.[21]

To narrow the field further, our target product can't take more than $500 to test, it has to lend itself to automation *within four weeks*, and—when up and running—it can't require more than *one day per week* of management.

Can a business be used to change the world, like The Body Shop or Patagonia? Yes, but that isn't our goal here.

Can a business be used to cash out through an IPO or sale? Yes, but that isn't our goal either.

Our goal is simple: to create an automated vehicle for generating cash without consuming time. That's it.[22] I will call this vehicle a "muse" whenever possible to separate it from the ambiguous term "business," which can refer to a lemonade stand or a Fortune 10 oil conglomerate—our objective is more limited and thus requires a more precise label.

So first things first: cash flow and time. With these two currencies, all other things are possible. Without them, nothing is possible.

Why to Begin with the End in Mind: A Cautionary Tale

Sarah is excited.

It has been two weeks since her line of humorous T-shirts for golfers went online, and she is averaging 5 T-shirt sales per day at $15 each. Her cost per unit is $5, so she is grossing $50 in profit (minus 3% in credit card fees) per 24 hours, as she passes shipping and handling on to customers. She should soon recoup the cost of her initial order of 300 shirts (including plate charges, setup, etc.)—but wants to earn more.

It's a nice reversal of fortune, considering the fate of her first product. She had spent $12,000 to develop, patent, and manufacture a high-tech stroller for new moms (she has never been a new mom), only to find that no one was interested.

The T-shirts, in contrast, were actually selling, but sales were beginning to slow.

It appears she has reached her online sales ceiling, as well-funded and uneducated competitors are now spending too much for advertising and driving up costs. Then it strikes her—retail!

Sarah approaches the manager of her local golf shop, Bill, who immediately expresses interest in carrying the shirts. She's thrilled.

Bill asks for the customary 40% minimum discount for wholesale pricing. This means her sell price is now $9 instead of $15 and her profit has dropped from $10 to $4. Sarah decides to give it a shot and does the same with three other stores in surrounding towns. The shirts begin to move off the shelves, but she soon realizes that her small profit is being eaten by extra hours she spends handling invoices and additional administration.

She decides to approach a distributor[23] to alleviate this labor, a company that acts as a shipping warehouse and sells products from various manufacturers to golf stores nationwide. The distributor is interested and asks for its usual pricing—70% off of retail or $4.50—which would leave Sarah 50 cents in the hole on each unit. She declines.

To make matters worse, the four local stores have already started discounting her shirts to compete among one another and are killing their own profit margins. Two weeks later, reorders disappear. Sarah abandons retail and returns to her website demoralized. Sales online have dropped to almost nothing with new competition. She has not recouped her initial investment, and she still has 50 shirts in her garage.

Not good.

It all could have been prevented with proper testing and planning.

Ed “Mr. Creatine” Byrd is no Sarah. He does not invest and hope for the best.

His San Francisco–based company, MRI, had the top-selling sports supplement in the U.S. from 2002–2005, NO_2. It is still a top-seller despite dozens of imitators. He did it through smart testing, smart positioning, and brilliant distribution.

Prior to manufacturing, MRI first offered a low-priced book related to the product through ¼-page advertisements in men’s health magazines. Once the need had been confirmed with a mountain of book orders, NO_2 was priced at an outrageous $79.95, positioned as the premium product on the market, and sold exclusively through GNC stores nationwide. No one else was permitted to sell it.

How can it make sense to turn away business? There are a few good reasons.

First, the more competing resellers there are, the faster your product goes extinct. This was one of Sarah’s mistakes.

It works like this: Reseller A sells the product for your recommended advertised price of $50, then reseller B sells it for $45 to compete with A, and then C sells it for $40 to compete with A and B. In no time at all, no one is making profit from selling your product and reorders disappear. Customers are now accustomed to the lower pricing and the process is irreversible. The product is dead and you need to create a new product. This is precisely the reason why so many companies need to create new product after new product month after month. It’s a headache.

I had one single supplement, BrainQUICKEN® (also sold as BodyQUICK®) for six years and maintained a consistent profit margin by limiting wholesale distribution, particularly online, to the top one or two largest resellers who could move serious quantities of product and who agreed to maintain a minimum advertised pricing.[24] Otherwise, rogue discounters on eBay and mom-and-pop independents will drive you broke.

Second, if you offer someone exclusivity, which most manufacturers try to avoid, it can work in your favor. Since you are offering one company 100% of the distribution, it is possible to negotiate better profit margins (offering less of a discount off of retail price), better marketing support in-store, faster payment, and other preferential treatment.

It is critical that you decide how you will sell and distribute your product before you commit to a product in the first place. The more middlemen are involved, the higher your margins must be to maintain profitability for all the links in the chain.

Ed Byrd realized this and exemplifies how doing the opposite of what most do can reduce risk and increase profit. Choosing distribution before product is just one example.

Ed drives a Lamborghini down the California coast when not traveling or in the office with his small focused staff and his two Australian shepherds. This outcome is not accidental. His product-creation methods—and those of the New Rich in general—can be emulated.

Here’s how you do it in the fewest number of steps.

Step One: Pick an Affordably Reachable Niche Market

> When I was younger … I [didn’t] want to be pigeonholed … Basically, now you want to be pigeonholed. It’s your niche.
>
> —JOAN CHEN, actress; appeared in *The Last Emperor* and *Twin Peaks*

Creating demand is hard. Filling demand is much easier. Don’t create a product, then seek someone to sell it to. Find a market—define your customers—then find or develop a product for them.

I have been a student and an athlete, so I developed products for those markets, focusing on the male demographic whenever possible. The audiobook I created for college guidance counselors failed because I have never been a guidance counselor. I developed the subsequent speed-reading seminar after realizing that I had free access to students, and the business succeeded because—being a student myself—I understood their needs and spending habits. Be a member of your target market and don’t speculate what others need or will be willing to buy.

Start Small, Think Big

> Some people are just into lavish dwarf entertainment.
>
> –DANNY BLACK (42″), part-owner of Shortdwarf.com[25]

Danny Black rents dwarfs as entertainment for $149 per hour. How is that for a niche market?

It is said that if everyone is your customer, then no one is your customer. If you start off aiming to sell a product to dog- or car-lovers, stop. It’s expensive to advertise to such a broad market, and you are competing with too many products and too much free information. If you focus on how to train German shepherds or a restoration product for antique Fords, on the other hand, the market and competition shrink, making it less expensive to reach your customers and easier to charge premium pricing.

BrainQUICKEN was initially designed for students, but the market proved too scattered and difficult to reach. Based on positive feedback from student-athletes, I relaunched the product as BodyQUICK and tested advertising in magazines specific to martial artists and powerlifters. These are minuscule markets compared to the massive student market, but not small. Low media cost and lack of competition enabled me to dominate with the first “neural accelerator”[26] in these niches. It is more profitable to be a big fish in a small pond than a small undefined fish in a big pond. How do you know if it’s big enough to meet your TMI? For a detailed real-life example of how I determined the market size of a recent product, see “Muse Math” on this book’s companion site.

Ask yourself the following questions to find profitable niches.

1. Which social, industry, and professional groups do you belong to, have you belonged to, or do you understand, whether dentists, engineers, rock climbers, recreational cyclists, car restoration aficionados, dancers, or other?

Look creatively at your resume, work experience, physical habits, and hobbies and compile a list of all the groups, past and present, that you can associate yourself with. Look at products and books you own, include online and offline subscriptions, and ask yourself, “What groups of people purchase the same?” Which magazines, websites, and newsletters do you read on a regular basis?

2. Which of the groups you identified have their own magazines?

Visit a large bookstore such as Barnes & Noble and browse the magazine rack for smaller specialty magazines to brainstorm additional niches. There are literally thousands of occupation- and interest/hobby-specific magazines to choose from. Use *Writer's Market* to identify magazine options outside the bookstores. Narrow the groups from question 1 above to those that are reachable through one or two small magazines. It's not important that these groups all have a lot of money (e.g., golfers)—only that they spend money (amateur athletes, bass fishermen, etc.) on products of some type. Call these magazines, speak to the advertising directors, and tell them that you are considering advertising; ask them to e-mail their current advertising rate card and include both readership numbers and magazine back-issue samples. Search the back issues for repeat advertisers who sell direct-to-consumer via 800 numbers or websites—the more repeat advertisers, and the more frequent their ads, the more profitable a magazine is for them … and will be for us.

Step Two: Brainstorm (Do Not Invest In) Products

> Genius is only a superior power of seeing.
>
> —JOHN RUSKIN, famed art and social critic

Pick the two markets that you are most familiar with that have their own magazines with full-page advertising that costs less than $5,000. There should be no fewer than 15,000 readers.

This is the fun part. Now we get to brainstorm or find products with these two markets in mind.

The goal is come up with well-formed product ideas and spend nothing; in Step 3, we will create advertising for them and test responses from real customers before investing in manufacturing. There are several criteria that ensure the end product will fit into an automated architecture.

The Main Benefit Should Be Encapsulated in One Sentence.

People can dislike you—and you often sell more by offending some—but they should never misunderstand you.

The main benefit of your product should be explainable in one sentence or phrase. How is it different and why should I buy it? ONE sentence or phrase, folks. Apple did an excellent job of this with the iPod. Instead of using the usual industry jargon with GB, bandwidth, and so forth, they simply said, "1,000 songs in your pocket." Done deal. Keep it simple and do not move ahead with a product until you can do this without confusing people.

It Should Cost the Customer $50–200.

The bulk of companies set prices in the midrange, and that is where the most competition is. Pricing low is shortsighted, because someone else is always willing to sacrifice more profit margin and drive you both bankrupt. Besides perceived value, there are three main benefits to creating a premium, high-end image and charging more than the competition.

1. Higher pricing means that we can sell fewer units—and thus manage fewer customers—and fulfill our dreamlines. It's faster.
2. Higher pricing attracts lower-maintenance customers (better credit, fewer complaints/questions,

3. Higher pricing also creates higher profit margins. It’s safer.

I personally aim for an *8–10x markup*, which means a $100 product can’t cost me more than $10–12.50.[27] If I had used the commonly recommended 5 x markup with BrainQUICKEN, it would have gone bankrupt within 6 months due to a dishonest supplier and late magazine. The profit margin saved it, and within 12 months it was generating up to $80,000 per month.

High has its limits, however. If the per-unit price is above a certain point, prospects need to speak to someone on the phone before they are comfortable enough to make the purchase. This is contraindicated on our low-information diet.

I have found that a price range of $50–200 per sale provides the most profit for the least customer service hassle. Price high and then justify.

It Should Take No More Than 3 to 4 Weeks to Manufacture.

This is critically important for keeping costs low and adapting to sales demand without stockpiling product in advance. I will not pursue any product that takes more than three to four weeks to manufacture, and I recommend aiming for one to two weeks from order placement to shippable product.

How do you know how long something takes to manufacture?

Contact contract manufacturers who specialize in the type of products you’re considering: http://www.thomasnet.com/. Call a related manufacturer (e.g., toilet bowls) if you need a referral to a related manufacturer you cannot find (e.g., toilet cleaning solutions). Still no luck? Google different synonyms for your product in combination with “organization” and “association” to contact the appropriate industry organizations. Ask them for referrals to contract manufacturers and for the names of their trade magazines, which often contain advertisements for contract manufacturers and related service providers we’ll need for your virtual architecture later. Request pricing from the contract manufacturers to ensure the proper markup is possible. Determine the per-unit costs of production for 100, 500, 1,000, and 5,000 units.

It Should Be Fully Explainable in a Good Online FAQ.

Here is where I really screwed up in my product choice with Brain-QUICKEN.

Even though ingestibles have enabled my **NR** life, I would not wish them on anyone. Why not? You get 1,000 questions from every customer: Can I eat bananas with your product? Will it make me fart during dinner? On and on, ad nauseam. Choose a product that you can fully explain in a good online FAQ. If not, the task of travelling and otherwise forgetting about work becomes very difficult or you end up spending a fortune on call center operators.

Understanding these criteria, a question remains: “How does one obtain a good muse product that satisfies them?” There are three options we’ll cover in ascending order of recommendation.

Option One: Resell a Product

Purchasing an existing product at wholesale and reselling it is the easiest route but also the least profitable. It is the fastest to set up but the fastest to die off due to price competition with other resellers. The profitable life span of each product is short unless an exclusivity agreement prevents others from selling it. Reselling is, however, an excellent option for secondary back-end[28] products that can be sold to existing customers or cross-sold[29] to new customers online or on the phone.

To purchase at wholesale, use these steps.

1. Contact the manufacturer and request a “wholesale pricelist” (generally 40% off retail) and terms.
2. If a business tax ID number is needed, print out the proper forms from your state’s Secretary of State website and file for an LLC (which I prefer) or similar protective business structure for $100–200.

Do NOT purchase product until you have completed Step 3 in the next chapter. It is enough at this point to confirm the profit margin and have product photos and sales literature.

That’s reselling. Not much more to it.

Option Two: License a Product

> I not only use all the brains that I have, but all that I can borrow.
>
> —WOODROW WILSON

Some of the world’s best-known brands and products have been borrowed from someone or somewhere else.

The basis for the energy drink Red Bull came from a tonic in Thailand, and the Smurfs were brought from Belgium. Pokémon came from the land of Honda. The band KISS made millions in record and concert sales, but the real profit has been in licensing—granting others the right to produce hundreds of products with their name and image in exchange for a percentage of sales.

There are two parties involved in a licensing deal, and a member of the New Rich could be either. First, there is the inventor of the product,[30] called the “licensor,” who can sell others the right to manufacture, use, or sell his or her product, usually for 3–10% of the wholesale price (usually around 40% off retail) for each unit sold. Invent, let someone else do the rest, and cash checks. Not a bad model.

The other side of the equation is the person interested in manufacturing and selling the inventor’s product for *90–97%* of the profit: the licensee. This is, for me and most **NR**, more interesting.

Licensing is, however, dealmaking-intensive on both sides and a science unto itself. Creative contract negotiation is essential and most readers will run into problems if it’s their first product. For real-world case studies on both sides, ranging from Teddy Ruxpin to Tae-Bo, and full agreements with actual dollar amounts, visit www.fourhourblog.com. From how to sell inventions without prototypes or patents to how to secure rights to products as a no-name beginner, it’s all there. The economics are fascinating and the profits can be astounding.

In the meantime, we will focus on the least complicated and most profitable option open to the most people: product creation.

Option Three: Create a Product

> Creation is a better means of self-expression than possession; it is through creating, not possessing, that life is revealed.
>
> —VIDA D. SCUDDER, *The Life of the Spirit in the Modern English Poets*

Creating a product is not complicated. “Create” sounds more involved than it actually is. If the idea is a hard product—an invention—it is possible to hire mechanical engineers or industrial designers on www.elance.com to develop a prototype based on your description of its function and appearance, which is then taken to a contract manufacturer. If you find a generic or stock product made by a contract manufacturer that can be re-purposed or positioned for a special market, it’s even easier: Have them manufacture it, stick a custom label on it for you, and presto—new product. This latter example is often referred to as “private labeling.” Have you ever seen a massage therapist’s office with its own line of vitamin products or the Kirkland brand at Costco? Private labeling in action.

It is true that we’ll be testing market response without manufacturing, but if the test is successful, manufacturing is the next step. This means we need to keep in mind setup costs, per-unit costs, and order minimums. Innovative gadgets and devices are great but often require special tooling, which makes the manufacturing start-up costs too expensive to meet our criteria.

Putting mechanical devices aside and forgetting about welding and engineering, there is one class of product that meets all of our criteria, has a manufacturing lead time of less than a week in small quantities, and often permits not just an 8–10 **x** markup, but a 20–50 **x** markup.

No, not heroin or slave labor. Too much bribing and human interaction required.

Information.

Information products are low-cost, fast to manufacture, and time-consuming for competitors to duplicate. Consider that the top-selling non-information infomercial products—whether exercise equipment or supplements—have a useful life span of two to four months before imitators flood the market. I studied economics in Beijing for six months and observed firsthand how the latest Nike sneaker or Callaway golf club could be duplicated and on eBay within a week of first appearing on shelves in the U.S. This is not an exaggeration, and I am not talking about a look-alike product—I mean an exact duplicate for 1/20 the cost.

Information, on the other hand, is too time-consuming for most knockoff artists to bother with when there are easier products to replicate. It’s easier to circumvent a patent than to paraphrase an entire course to avoid copyright infringement. Three of the most successful television products of all time—all of which have spent more than 300 weeks on the infomercial top-10 bestseller lists—reflect the competitive and profit margin advantage of information products.

No Down Payment (Carlton Sheets)
Attacking Anxiety and Depression (Lucinda Bassett)
Personal Power (Tony Robbins)

I know from conversations with the principal owners of one of the above products that more than $65 million worth of information moved through their doors in 2002. Their infrastructure consisted of fewer than 25 in-house operators, and the rest of the infrastructure, ranging from media purchasing to shipping, was outsourced.

Their annual revenue-per-employee is more than $2.7 million. Incredible.

DVD for less than $200 and sold it to owners of storage facilities who wanted to install security systems. It’s hard to get more niche than that. In 2001, selling DVDs that cost $2 to duplicate for $95 apiece through trade magazines, he made several hundred thousand dollars with no employees.

But I’m Not an Expert!

If you aren’t an expert, don’t sweat it.

First, “expert” in the context of selling product means that you know more about the topic than the purchaser. No more. It is not necessary to be the best—just better than a small target number of your prospective customers. Let’s suppose that your current dreamline—to compete in the 1,150-mile Iditarod dogsledding race in Alaska—requires $5,000 to realize. If there are 15,000 readers and even 50 (0.33%) can be convinced of your superior expertise in skill X and spend $100 for a program that teaches it, that is $5,000. Bring on the Huskies. Those 50 customers are what I call the “minimal customer base”—the minimum number of customers you need to convince of your expertise to fulfill a given dreamline.

Second, expert status can be created in less than four weeks if you understand basic credibility indicators. It’s important to learn how the PR pros phrase resume points and position their clients. See the boxed text later in this chapter to learn how.

The degree to which you personally need expert status also depends on how you obtain your content. There are three main options.

1. Create the content yourself, often via paraphrasing and combining points from several books on a topic.
2. Repurpose content that is in the public domain and not subject to copyright protection, such as government documents and material that predates modern copyright law.
3. License content or compensate an expert to help create content. Fees can be one-time and paid up front or royalty-based (5–10% of net revenue, for example).

If you choose option 1 or 2, you need expert status within a limited market.

Let’s assume you are a real estate broker and have determined that, like yourself, most brokers want a simple but good website to promote themselves and their businesses. If you read and understand the three top-selling books on home-page design, you will know more about that topic than 80% of the readership of a magazine for real estate brokers. If you can summarize the content and make recommendations specific to the needs of the real estate market, a 0.5–1.5% response from an ad you place in the magazine is not unreasonable to expect.

Use the following questions to brainstorm potential how-to or informational products that can be sold to your markets using your expertise or borrowed expertise. Aim for a combination of formats that will lend itself to $50–200 pricing, such as a combination of two CDs (30–90 minutes each), a 40-page transcription of the CDs, and a 10-page quickstart guide. Digital delivery is perfectly acceptable—in some cases, ideal—if you can create a high enough perceived value.

1. How can you tailor a general skill for your market—what I call “niching down”—or add to what is being sold successfully in your target magazines? Think narrow and deep rather than broad.

2. What skills are you interested in that you—and others in your markets—would pay to learn? Become an expert in this skill for yourself and then create a product to teach the same. If you need help or want

to speed up the process, consider the next question.

3. What experts could you interview and record to create a sellable audio CD? These people do not need to be the best, but just better than most. Offer them a digital master copy of the interview to do with or sell as they like (this is often enough) and/or offer them a small up-front or ongoing royalty payment. Use Skype.com with HotRecorder (more on these and related tools in Tools and Tricks) to record these conversations directly to your PC and send the mp3 file to an online transcription service.

4. Do you have a failure-to-success story that could be turned into a how-to product for others? Consider problems you've overcome in the past, both professional and personal.

The Expert Builder: How to Become a Top Expert in 4 Weeks

It's time to obliterate the cult of the expert. Let the PR world scorn me. First and foremost, there is a difference between *being perceived* as an expert and *being* one. In the context of business, the former is what sells product and the latter, relative to your "minimal customer base," is what creates good products and prevents returns.

It is possible to know all there is to know about a subject—medicine, for example—but if you don't have M.D. at the end of your name, few will listen. The M.D. is what I term a "credibility indicator." The so-called expert with the most credibility indicators, whether acronyms or affiliations, is often the most successful in the marketplace, even if other candidates have more in-depth knowledge. This is a matter of superior positioning, not deception.

How, then, do we go about acquiring credibility indicators in the least time possible? Emulating the client-grooming techniques of some of the best PR firms in New York City and Los Angeles isn't a bad place to start.

It took a friend of mine just three weeks to become a "top relationship expert who, as featured in *Glamour* and other national media, has counseled executives at Fortune 500 companies on how to improve their relationships in 24 hours or less." How did she do it?

She followed a few simple steps that created a credibility snowball effect. Here's how you can do the same.

1. **Join two or three related trade organizations** with official-sounding names. In her case, she chose the Association for Conflict Resolution (www.acrnet.org) and The International Foundation for Gender Education (www.ifge.org). This can be done online in five minutes with a credit card.
2. **Read the three top-selling books** on your topic (search historical *New York Times* bestseller lists online) and summarize each on one page.
3. **Give one free one-to-three-hour seminar** at the closest well-known university, using posters to advertise. Then do the same at branches of two well-known big companies (AT&T, IBM, etc.) located in the same area. Tell the company that you have given seminars at University X or X College and are a member of those groups from step 1. Emphasize that you are offering it to them for free to get additional speaking experience outside of academics and will not be selling products or services. Record the seminars from two angles for later potential use as a CD/DVD product.
4. **Optional: Offer to write one or two articles for trade magazines** related to your topics, citing what you have accomplished in steps 1 and 3 for credibility. If they decline, offer to interview a known expert and write the article—it still gets your name listed as a contributor.
5. **Join ProfNet**, which is a service that journalists use to find experts to quote for articles. Getting PR is simple if you stop shouting and start listening. Use steps 1, 3, and 4 to demonstrate credibility and

online research to respond to journalist queries. Done properly, this will get you featured in media ranging from small local publications to the *New York Times* and ABC News.

Becoming a recognized expert isn't difficult, so I want to remove that barrier now.

I am not recommending pretending to be something you're not. I can't! "Expert" is nebulous media-speak and so overused as to be indefinable. In modern PR terms, proof of expertise in most fields is shown with group affiliations, client lists, writing credentials, and media mentions, not *IQ* points or Ph.D.s.

Presenting the truth in the best light, but not fabricating it, is the name of the game.

See you on CNN.

► Q&A: QUESTIONS AND ACTIONS

For this hands-on chapter, the Q&A is simple. In fact, it's more like a Q.

The question is, "Did you read the chapter and follow the directions?" If not, do it! Instead of the usual Q&A, the end of this chapter and the following two will feature more extensive resources for taking the action steps described in detail in the text.

► COMFORT CHALLENGE

Find Yoda (3 Days)

Call at least one potential superstar mentor per day for three days. E-mail only after attempting a phone call. I recommend calling before 8:30 A.M. or after 6:00 P.M. to reduce run-ins with secretaries and other gatekeepers. Have a single question in mind, one that you have researched but have been unable to answer yourself. Shoot for "A" players—CEOs, ultrasuccessful entrepreneurs, famous authors, etc.—and don't aim low to make it less frightening. Use www.contactanycelebrity.com if need be, and base your script on the following.

Unknown answerer: This is Acme Inc. [or "the office of Mentor X"].

You: Hi, this is Tim Ferriss calling for John Grisham, please.[31]

Answerer: May I ask what this is regarding?

You: Sure. I know this might sound a bit odd,[32] but I'm a first-time author and just read his interview in *Time Out New York*.[33] I'm a longtime[34] fan and have finally built up the courage to[35] call him for one specific piece of advice. It wouldn't take more than two minutes of his time. Is there any way you can help me get through to him?[36]I really, really appreciate whatever you can do.

Answerer: Hmmm … Just a second. Let me see if he's available. [two minutes later] Here you go. Good luck. [rings to another line]

John Grisham: John Grisham here.

You: Hi, Mr. Grisham. My name is Tim Ferriss. I know this might sound a bit odd, but I'm a first-time author and a longtime fan. I just read your interview in *Time Out New York* and finally built up the courage to call. I have wanted to ask you for a specific piece of advice for a long time, and it shouldn't take more than two minutes of your time. May I?[37]

John Grisham: Uh … OK. Go ahead. I have to be on a call in a few minutes.

You (at the very end of the call)**:** Thank you so much for being so generous with your time. If I have the occasional tough question—very occasional—is there any chance I could keep in touch via e-mail?[38]

► LIFESTYLE DESIGN IN ACTION

OVER THE MOON

My 13-year-old daughter would like to be an astronaut when she grows up. Last year she had an extreme challenge to deal with. The phrase from *Apollo 13* "Failure is not an option" sort of became our motto. I got the idea of contacting the commander of *Apollo 13*, Jim Lovell. It didn't take much to find him and he sent her a wonderful letter about his ordeal just to get into the *Apollo* program, not to mention dealing with a crippled spacecraft. His letter made a big difference to my daughter. A couple months later, we were able to take things a little further by getting her VIP access to a shuttle launch.

—ROB

► TOOLS AND TRICKS

Confirming Sufficient Market Size

►Compete (www.compete.com) and
Quantcast (www.quantcast.com)

Find the number of monthly visitors for most websites, in addition to the search terms that generate the most traffic for them.

► Writer's Market (www.writersmarket.com)

Here you'll find a listing of thousands of specialty and niche magazines, including circulation and subscription numbers. I prefer the print version.

► Spyfu (www.spyfu.com)

Download competitors' online advertising spending, keywords, and ad-word details. Consistent and repeat spending generally indicates successful advertising ROI.

► **Standard Rate and Data Services (www.srds.com)**

Check out this resource for annual listings of magazine and company customer mailing lists available for rent. If you're considering creating a how-to video for duck hunting, check out the size of customer lists from hunting gun manufacturers and related magazines first. Use the print version in libraries instead of paying for the somewhat confusing online access.

Finding Products to Resell or Manufacturing

► **Affiliate Networks: Clickbank (www.clickbank.com),
Commission Junction (www.cj.com), Amazon Associates (www.amazon.com/associates)**

No inventory, no invoices. Experimenting with products and categories through affiliate networks such as Clickbank and Commission Junction, which pay you 10–75% of each purchase, is a fast method for doing a proof-of-concept using similar products. It's often worth setting up accounts at both just to observe how bestselling items are being sold and promoted.

Amazon Associates averages 7–10% commissions, but bestselling books are excellent for testing target markets for more elaborate informational products. For all of the above: Do not get into bidding wars against other affiliates using expensive general keywords or overexposed brand names. Go niche or go broke.

► **Alibaba (www.alibaba.com)**

Based in China, Alibaba is the world's largest business-to-business marketplace. From MP3 players for $9 each to red wine for $2 per bottle, this site is the source. If someone here doesn't make it, it probably can't be made.

► **Worldwide Brands (www.worldwidebrands.com)**

Offers an extensive how-to guide for finding manufacturers willing to dropship product to your customers, which allows you to avoid pre-purchasing inventory. This is where Amazon and eBay power users find not just drop shippers, but also wholesalers and liquidators. Shopster (www.shopster.com) is also a popular option, with more than 1,000,000 dropship products to choose from.

► **Thomas's Register of Manufacturers (www.thomasnet.com) (800–699–9822)**

Searchable database of contract manufacturers for every conceivable product, from underwear and food products to airplane parts.

► **Electronics, DVDs, Books (www.ingrambook.com , www.techdata.com)**

► **Housewares and Hardware (www.housewares.org , www.nationalhardwareshow.com) (847–292–4200)**

For these product categories and related talent (on-screen demonstrations), also consider attending local or state fairs.

► **Consumables and Vitamin Products (www.expoeast.com , expowest.com)**

Finding Public Domain Information to Repurpose

Be sure to speak with an intellectual property attorney before using apparent public domain material. If someone modifies 20% of a public domain work (through abridging and footnotes, for example), their "new" complete work can be copyrighted. Using it without permission would then be a punishable infringement. The details can get confusing. Do the beginning research yourself, but get a pro to look over your findings before moving ahead with product development.

► **Project Gutenberg (www.gutenberg.org)**

Project Gutenberg is a digital library of more than 15,000 pieces of literature considered to be in the public domain.

► **LibriVox (www.librivox.org)**

LibriVox is a collection of audiobooks from the public domain that are available for free download.

Recording Seminars or Phone Interviews with Experts for CD Downloadable Products

► **HotRecorder (www.hotrecorder.com) (PC), Call Recorder (http://ecamm.com/mac/callrecorder/) (Mac)**

Use these programs to record any inbound or outbound phone call via computer using Skype (www.skype.com) and other VoIP programs.

► **NoCost Conference (www.nocostconference.com)**

Provides a free 800-number conference line, as well as free recording and file retrieval. Normal phones can be used for call-in, so no computer or web connection is required for participants. If you'll have a Q&A, I suggest soliciting attendee questions beforehand to avoid issues with muting/ unmuting of lines.

►**Jing Project** (www.jingproject.com) and **DimDim** (www.dimdim.com)

If you'd like to record the actions on your screen for video tutorials, both of these free programs will get the job done. If you need advanced editing features, Jing's big brother Camtasia is the industry standard (www.camtasia.com).

Licensing Ideas to Others for Royalties

► **InventRight (www.inventright.com) (800–701–7993)**

Stephen Key is the most consistently successful inventor I've ever met, with millions in royalties from companies like Disney, Nestlé, and Coca-Cola. He is not high-tech but specializes in creating simple products, or improving on existing products, and then licensing (renting) his ideas to large corporations. He comes up with the idea, files a provisional patent for less than $200, and then lets another company do the work while he collects checks. This site introduces his fail-proof process for doing the same. His techniques for cold-calling alone are invaluable. Highly recommended.

►**Guthy-Renker Corporation (www.guthyrenker.com) (760–773–9022)** GRC is the 800-pound infomercial gorilla. It brings in more than $1.3 billion per year in sales with mega-hits like Tony Robbins, Proactiv Solution, and Winsor Pilates. Don't expect more than a 2–4% royalty if you make the cut, but the numbers are huge enough to make it worth a look. Submit your product online.

Searching Patents for Unexploited Ideas to Turn into Products

- ► **United States Patent and Trademark Office (www.uspto.gov) (800–786–9199)**
- ► **Licensable Technologies Developed at Universities** (**www.autm.net** ; see "view all listings" under "Technology Transfer Offices")
- ► **Inventors Groups and Associations** (call and ask if members have anything to license) (**www.uiausa.org/Resources/InventorGroups.htm**

Becoming an Expert

►**Prof Net via PR Leads (www.prleads.com)** and **HARO (www.helpareporterout.com)**

Receive daily leads from journalists and TV and radio producers looking for experts to cite and interview for media ranging from local outlets to CNN and the *New York Times*. Stop swimming upstream and start responding to stories people are already working on. HARO offers select leads at no cost, and you can mention my name with PR Leads to get two months for the price of one.

►**PRWeb Press Releases (www.prwebdirect.com)** The press release is dead for most purposes, but using this service has some serious search-engine benefits, such as appearing at the top of related Google News and Yahoo! News results.

► **ExpertClick (www.expertclick.com)**

This is another secret of the PR pros. Put up an expert profile for media to see, receive an up-to-date database of top media contacts, and send free press releases to 12,000 journalists, all on one website that gets more than 5 million hits per month. This is how I got on NBC and ended up developing a prime-time TV show. It works. Mention my name on the phone, or use “Tim Ferriss $100” online, to get a $100 discount.

► LIFESTYLE DESIGN IN ACTION

Bon Jour Tim,

I was in Barnes & Noble at the help desk this past Saturday, April 25, waiting for an employee to get a book for me *(Tropic of Cancer if* you must know). While I was waiting, I noticed a copy of *4-Hour Workweek* on the counter that someone else had ordered. Not one to be shy, I reached over the counter and started reading their copy. As you might guess, I had the employee go back and get me my own copy. Haven’t finished *Tropic of Cancer* but finished your book …

… On Monday I got a yes when I asked my boss to work two days remotely per week. I start next week.

On Monday I also booked the most stunning apartment in Paris for the month of September, at a cost of half of the rent I pay in Southern California. I plan to increase my remote time now through August so that September will be an easy ask to leave for remote work. If the answer happens to be no (which I now doubt), I will be prepared to quit my job.

Now at work on my Income Autopilot project.

Tim: amazing. My life has changed in three days. (Plus, your book was funny as hell.) Thank you!!! ***—CINDY FRANKEY***

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21. There are a few limited exceptions, such as online membership sites that don’t require content generation, but as a general rule, products require much less maintenance and will get you to your TMI faster.

22. Muses will provide the time and financial freedom to realize your dreamlines in record time, after which one can (and often does) start additional companies to change the world or sell.

23. Distributors are sometimes also referred to as “wholesalers,” depending on the industry.

24. It is illegal to control how much someone sells your product for, but you can dictate how much they advertise it for. This is done by including a Minimum Advertised Pricing (MAP) policy in your General Terms and Conditions (GTC), which are agreed to automatically when a written wholesale order is placed. Sample GTC and order forms are available at www.fourhourblog.com.

25. *The Wall Street Journal*, July 18, 2005 (http://www.technologyinvestor.com/login/2004/Jul18-05.php).

26. This was a new product category that I created to eliminate and preempt the competition. Strive to be the largest, best, or first in a precise category. I prefer being first.

27. If you decide to resell someone else's higher-end products like Doug, especially with drop-shipping, the risk is lower and smaller margins can suffice.

28. "Back-end" products are products sold to customers once the sale of a primary product has been made. iPod covers and car GPS systems are two examples. These products can have lower margins, because there is no advertising cost to acquire the customer.

29. "Cross-selling" is selling a related product to a customer while they're still on the phone or in an online shopping cart after the sale of a primary product has been made. For a full marketing and direct response (DR) glossary, visit www.fourhourblog.com.

30. This also refers to owners of copyrights or trademarks.

31. Said casually and with confidence, this alone will get you through surprisingly often. "I'd like to speak with Mr./Ms. X, please" is a dead giveaway that you don't know them. If you want to up the chances of getting though but risk looking foolish if they call the bluff, ask for the target mentor by first name only.

32. I use this type of lead-in whenever making off-the-wall requests. It softens it and makes the person curious enough to listen before spitting out an automatic "no."

33. This answers the questions they'll have in their head: "Who are you and why are you calling now?" I like to be a "first-time" something to play the sympathy card, and I find a recent media feature online to cite as the trigger for calling.

34. I call people I'm familiar with. If you can't call yourself a longtime fan, tell them that you have followed the mentor's career or business exploits for a certain number of years.

35. Don't pretend to be strong. Make it clear you're nervous and they'll lower their guard. I often do this even if I'm not nervous.

36. The wording here is critical. Ask them to "help" you do something.

37. Just rework the gatekeeper paragraph for this, and don't dillydally—get to the point quickly and ask for permission to pull the trigger.

38. End the conversation by opening the door for future contact. Start with e-mail and let the mentoring relationship develop from there.

⑩

Income Autopilot II

► TESTING THE MUSE

> Many of these theories have been killed off only when some decisive experiment exposed their incorrectness.... Thus the yeoman work in any science ... is done by the experimentalist, who must keep the theoreticians honest.
>
> —MICHIO KAKU, theoretical physicist and cocreator of String Field Theory, *Hyperspace*

Fewer than 5% of the 195,000 books published each year sell more than 5,000 copies. Teams of publishers and editors with decades of combined experience fail more times than not. The founder of Border's Books lost $375 million of investor funding with WebVan,[39] a nationwide grocery delivery service. The problem? No one wanted it.

The moral is that intuition and experience are poor predictors of which products and businesses will be profitable. Focus groups are equally misleading. Ask ten people if they would buy your product. Then tell those who said "yes" that you have ten units in your car and ask them to buy. The initial positive responses, given by people who want to be liked and aim to please, become polite refusals as soon as real money is at stake.

To get an accurate indicator of commercial viability, don't ask people if they would buy—ask them to buy. The response to the second is the only one that matters. The approach of the **NR** reflects this.

Step Three: Micro-Test Your Products

Micro-testing involves using inexpensive advertisements to test consumer response to a product prior to manufacturing.[40]

In the pre-Internet era, this was done using small classified ads in newspapers or magazines that led prospects to call a prerecorded sales message. Prospects would leave their contact information, and based on the number of callers or response to a follow-up sales letter, the product would be abandoned or manufactured.

In the Internet era, there are better tools that are both cheaper and faster. We'll test the product ideas from the last chapter on Google Adwords—the largest and most sophisticated Pay-Per-Click (PPC) engine—in five days for $500 or less. PPC here refers to the highlighted search results that are listed above and to the right of normal search results on Google. Advertisers pay to have these ads displayed when people search for a certain term related to the advertisers' product, such as "cognitive supplement," and are charged a small fee from $.05 to over $1 each time someone clicks through to their site. For a good introduction to Google Adwords and PPC, visit www.google.com/onlinebusiness. For expanded examples of the following PPC strategies, visit www.fourhourblog.com and search "PPC."

The basic test process consists of three parts, each of which is covered in this chapter.

Best: Look at the competition and create a more-compelling offer on a basic one-to-three-page website (one to three hours).

Test: Test the offer using short Google Adwords advertising campaigns (three hours to set up and five days of passive observation).

Divest or Invest: Cut losses with losers and manufacture the winner(s) for sales rollout.

Let's use two people, Sherwood and Johanna, and their two product ideas—French sailor shirts and a how-to yoga DVD for rock climbers—as case studies of what the testing steps look like and how you can do the same.

Sherwood bought a striped sailing shirt in France while traveling last summer, and upon returning to NYC has been continually approached by 20–30-year-old males on the street who want to know where to get their own. Sensing an opportunity, he requests back issues of NYC-based weekly magazines aimed at this demographic and calls the manufacturer in France for pricing. He learns that he can purchase shirts at a wholesale price of $20 that sell for $100 retail. He adds $5 per shirt to account for shipping to the U.S. and arrives at a per-shirt cost of $25. It's not quite our ideal markup (4x vs. 8–10x), but he wants to test the product regardless.

Johanna is a yoga instructor who has noticed her growing client base of rock climbers. She is also a rock climber and is considering creating a yoga instructional DVD tailored to that sport, which would include a 20-page spiral-bound manual and be priced at $80. She predicts that production of a low-budget first edition of the DVD would cost nothing more than a borrowed digital camera and a friend's iMac for simple editing. She can burn small quantities of this first-edition DVD—no menus, just straight footage and titles—on the laptop and create labels with freeware from www.download.com. She has contacted a duplication house and learned that more-professional DVDs will cost $3–5 apiece to duplicate in small quantities (minimum of 250), including cases.

Now that they have ideas and estimates of start-up costs, what next?

Besting the Competition

First and foremost, each product must pass a competitive litmus test. How can Sherwood and Johanna beat the competition and offer a superior product or guarantee?

1. Sherwood and Johanna Google the top terms each would use to try and find their respective products. To come up with related terms and derivative terms, both use search term suggestion tools.

Google Adwords Keyword Tool (http://adwords.google.com/select/KeywordToolExternal) Enter the potential search terms to find search volume and alternative terms with more search traffic. Click on the "Approx Avg Search Volume" column to sort results from most to least searched.

SEOBook Keyword Tool, SEO for Firefox Extension (http://tools.seobook.com/) This is an outstanding resource page with searches powered by Wordtracker (www.wordtracker.com).

Both then visit the three websites that consistently appear in top search and PPC positions. How can Sherwood and Johanna differentiate themselves?

- ► Use more credibility indicators? (media, academia, associations, and testimonials)
- ► Create a better guarantee?
- ► Offer better selection? [41]
- ► Free or faster shipping?

Sherwood notices that the shirts are often hard to find on the competitive sites, all of which feature dozens of products, and the shirts are either made in the U.S. (inauthentic) or shipped from France (customers must wait two to four weeks). Johanna cannot find a “yoga for rock climbing” DVD, so she is starting from a blank slate.

2. Sherwood and Johanna now need to create a one-page (300–600 words) testimonial-rich advertisement that emphasizes their differentiators and product benefits using text and either personal photos or stock photos from stock photo websites. Both have spent two weeks collecting advertisements that have prompted them to make purchases or that have caught their attention in print or online—these will serve as models.[42] Johanna asks her clients for testimonials and Sherwood lets his friends try on the shirts to get several for his page. Sherwood also asks the manufacturer for photos and advertising samples.

See www.pxmethod.com for a good example of how I have created a test page using testimonials from seminar attendees. Please note that it’s just a template for readers and not a live sales page. Free how-to seminars as recommended in the Expert Builder are ideal for identifying popular selling points and securing testimonials.

Testing the Advertisement

Sherwood and Johanna now need to test actual customer response to their advertisements. Sherwood first tests his concept with a 72-hour eBay auction that includes his advertising text. He sets the “reserve” (the lowest price he’ll accept) for one shirt at $50 and cancels the auction last minute to avoid legal issues since he doesn’t have product to ship. He has received bids up to $75 and decides to move to the next phase of testing. Johanna doesn’t feel comfortable with the apparent deception and skips this preliminary testing.

Sherwood’s cost: <$5.

Both register domain names for their soon-to-be one-page sites using the cheap domain registrar www.domainsinseconds.com. Sherwood chooses www.shirtsfromfrance.com and Johanna chooses www.yogaclimber.com. For additional domain names, Johanna uses www.domainsinseconds.com.

Cost to both: <$20.

Sherwood uses www.weebly.com to create his one-page site advertisement and then creates two additional pages using the form builder www.wufoo.com. If someone clicks on the “purchase” button at the bottom of the first page, it takes them to a second page with pricing, shipping and handling,[43] and basic contact fields to fill out (including e-mail and phone). If the visitor presses “continue with order,” it takes them to a page that states, “Unfortunately, we are currently on back order but will contact you as soon as we have product in stock. Thank you for your patience.” This structure allows him to test the first-page ad and his pricing separately. If someone gets to the last page, it is considered an order.

Johanna is not comfortable with “dry testing,” as Sherwood’s approach is known, even though it is legal if the billing data isn’t captured. She instead uses the same two services to create a single webpage with the content of her one-page ad and an e-mail sign-up for a free “top 10 tips” list for using yoga for rock climbing. She will consider 60% of the sign-ups as hypothetical orders.

Cost to both: <$0.

Both set up simple Google Adwords campaigns with 50–100 search terms to simultaneously test headlines while driving traffic to their pages. Their daily budget limits are set at $50 per day. (At this segue into PPC testing, I recommend you first visit www.adwords/google.com/onlinebusiness and then follow along by creating your own account, which should take about 10 minutes. It would be a waste of rain forests to use ten pages to explain terms that can be understood at a glance online.)

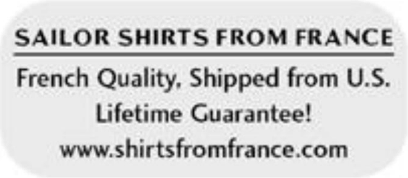
Sherwood and Johanna decide on the best search terms by using the search term suggestion tools mentioned earlier. Both aim for specific terms when possible ("french sailor shirts" vs. "french shirts;" "yoga for sports" vs. "yoga") for higher conversion rates (the percentage of visitors that purchase) and lower cost-per-click (CPC). They aim also for second through fourth positioning, but no more than $.20 CPC.

Sherwood will use Google's free analytical tools to track "orders" and page abandonment rates—what percentage of visitors leave the site from which pages. Johanna will use www.wufoo.com to track e-mail sign-ups on this small testing scale.[44]

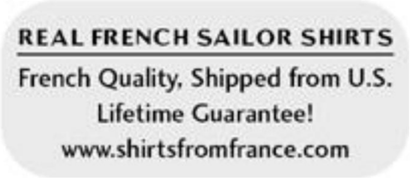
Cost to both: $0.

Both Johanna and Sherwood design Adwords ads that focus on their differentiators. Each Google Adwords ad consists of a headline and then two lines of description, neither of which can exceed 35 characters. In Sherwood's case, he creates five groups of 10 search terms each. The following are two of his ads.

SAILOR SHIRTS FROM FRANCE

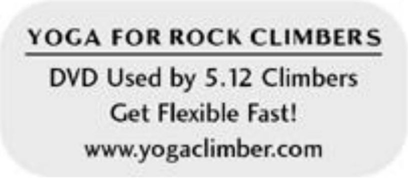


SAILOR SHIRTS FROM FRANCE
French Quality, Shipped from U.S.
Lifetime Guarantee!
www.shirtsfromfrance.com

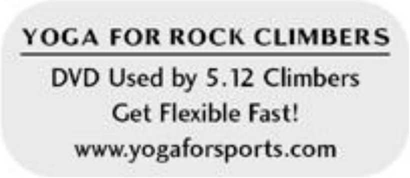


REAL FRENCH SAILOR SHIRTS
French Quality, Shipped from U.S.
Lifetime Guarantee!
www.shirtsfromfrance.com

Johanna creates the same five groups of 10 terms each and tests a number of ads, including these:



YOGA FOR ROCK CLIMBERS
DVD Used by 5.12 Climbers
Get Flexible Fast!
www.yogaclimber.com



YOGA FOR ROCK CLIMBERS
DVD Used by 5.12 Climbers
Get Flexible Fast!
www.yogaforsports.com

Notice that these ads can be used to test not just headlines but guarantees, product names, and domain names. It's as simple as creating several ads, rotated automatically by Google, that are identical except for the one variable to be tested. How do you think I determined the best title for this book?

Both Sherwood and Johanna disable the feature on Google that serves only the best-performing ad. This is necessary to later compare the click-through rates from each and combine the best elements (headline, domain name, and body text) into a final ad.

Last but not least, ensure that the ads don't trick prospects into visiting the site. The product offer should be clear. Our goal is qualified traffic, so we do not want to offer something "free" or otherwise attract window shoppers or the curious who are unlikely to buy.

Cost to both: $50 or less per day **x** 5 days = $250.[45]

Investing or Divesting

Five days later, it's time to tally the results.

What can we consider a "good" click-through and conversion rate? This is where the math can be deceiving. If we're selling a $10,000 abominable snowman suit with an 80% profit margin, we obviously need a much lower conversion rate than someone who is selling a $50 DVD with a 70% profit margin.

For sophisticated tools and free spreadsheets that do all sorts of calculations for you, visit the reader-only resources at www.fourhourblog.com.

Johanna and Sherwood decide to keep it simple at this stage: How much did they spend on PPC ads and how much did they "sell"?

Johanna has done well. The traffic wasn't enough to make the test stand up to statistical scrutiny, but she spent about $200 on PPC and got 14 sign-ups for a free 10-tip report. If she assumes 60% would purchase, that means 8.4 people **x** $75 profit per DVD = $630 in hypothetical total profit. This is also not taking into account the potential lifetime value of each customer.

The results of her small test are no guarantee of future success, but the indications are positive enough that she decides to set up a Yahoo Store for $99 per month and a small per-transaction fee. Her credit isn't excellent, so she will opt to use www.paypal.com to accept credit cards online instead of approaching her bank for a merchant account.[46] She e-mails the 10-tip report to those who signed up and asks for their feedback and recommendations for content on the DVD. Ten days later, she has a first attempt at the DVD ready to ship and her store is online. Her sales to the original sign-ups cover costs of production and she is soon selling a respectable 10 DVDs per week ($750 profit) via Google Adwords. She plans to test advertising in niche magazines and blogs and now needs to create an automation architecture to remove herself from the equation.

Sherwood didn't fare as well but still sees potential. He spent $150 on PPC and "sold" three shirts for a hypothetical $225 in profit. He had more than enough traffic, but the bulk of visitors left the site on the pricing page. Rather than drop pricing, he decides to test a "2x money-back guarantee" on the pricing page, which will enable customers to get a $200 refund if the $100 shirts aren't the "most comfortable they've ever owned." He retests and "sells" seven shirts for $525 in profit. Based on these results, he sets up a merchant account through his bank and Authorize.net to process credit cards, orders a dozen shirts from France, and sells them all over the following ten days. This gives him enough profit to buy a small display ad at 50% off (asking for a "first-time advertiser discount" and then citing a competing magazine to get another 20% off) in a local weekly art magazine, in which he calls the shirt "Jackson Pollock Shirts." He orders two dozen more shirts with net-30 payment terms and puts a toll-free number[47] in the print ad that forwards to his cell phone. He does this instead of using a website for two reasons: (1) He wants to determine the most common questions for his FAQ online, and (2) he wants to test an offer of $100 for one shirt ($75 in profit) or "buy two, get one free" ($200 - $75 = $125 profit).

He sells all 24 shirts in the first five days the magazine runs, most through the special offer. Success. He redesigns the print ad, putting answers to common questions in the text to cut down on calls for information, and decides to negotiate a longer-term ad agreement with the magazine. He sends his sales rep a check for four issues at 30% of their published rates. He calls to confirm that they received his check via FedEx and, with check in hand and deadlines looming, they don't refuse.

Sherwood wants to go to Berlin during a two-week break from his job, which he is now considering quitting. How can he roll out his success and escape his own company? He needs to build the architecture and get his mobile M.B.A.

That's where the next chapter comes in.

New Rich Revisited: How Doug Did It

Remember Doug from ProSoundEffects.com? How did he test the idea and go from $0 to $10,000 per month in the process? He followed these steps.

1. Market Selection

He chose music and television producers as his market because he is a musician himself and has used these products.

2. Product Brainstorm

He chose the most popular products available for resale from the largest manufacturers of sound libraries and arranged a wholesale purchase and drop-ship agreement with them. Many of these libraries cost well above $300 (up to $7,500), and this is precisely why he needs to answer more customer-service questions than someone with a lower-priced product of $50–200.

3. Micro-Testing

He auctioned the products on eBay to test demand (and the highest possible pricing) before purchasing inventory. He ordered product only when people placed orders from him, and product shipped immediately from the manufacturers' warehouses. Based on this demand confirmed on eBay, Doug created a Yahoo Store with these products and began testing Google Adwords and other PPC search engines.

4. Rollout and Automation

Following this testing, and upon generating sufficient cash flow, Doug began experimenting with print advertising in trade magazines. Simultaneously, he streamlined and outsourced operations to reduce his time requirements from two hours per day to two hours per week.

► COMFORT CHALLENGE

Rejecting First Offers and Walking Away (3 Days)

Before performing this exercise, if possible, read the bonus chapter "How to Get $700,000 of Advertising for $10,000" on our companion site, and then set aside two hours on a consecutive Saturday, Sunday, and Monday.

On Saturday and Sunday, go to a farmers' market or other outdoor event where goods are sold. If this isn't possible, go to small independent retailers (not chains or mass retail).

Set a budget of $100 for your negotiating tuition and look for items to purchase that total at least $150. Your job is to get the sellers down to a total of $100 or less for the lot. It is better to practice on many cheap items rather than a few big items. Be sure to reply to their first offer with, "What type of discount can you offer?" to let them negotiate against themselves. Negotiate near closing time, choose your objective price, bracket, and make a firm offer with cash in hand for that amount.[48] Practice walking away if your objective price isn't met. On Monday, call two magazines (expect the first to be awkward) and use the script on the companion site to negotiate, minus the last firm offer. Get them as low as possible and then call them back later to indicate that your proposal was refused by upper management or otherwise vetoed.

This is the negotiating equivalent of paper trading.[49] Get used to refusing offers and countering in person and—most importantly—on the phone.

► TOOLS AND TRICKS

Sample Muse Test Page

► The PX Method (www.pxmethod.com)

This sales template was used to determine the viability of a speed-reading product, which tested successfully. Notice how testimonials, credibility indicators, and risk-reversal guarantees are used, as well as how the pricing is put on a separate page so it can be isolated as a testing variable. Use this as a reference—it is a simple and effective model that can be copied. Please do not input your credit card information, as it is just a mock-up for teaching purposes.

Fast and Simple Website Creation for Non-Techies (and Techies)

► Weebly (www.weebly.com)

Weebly, which the BBC labeled “a must,” allowed me to create www.timothyferriss.com in less than two hours and have it appear on the front page of Google for “timothy ferriss” searches within 48 hours. It is, like WordPress.com below, designed to be very SEO-friendly (search-engine optimization) without any knowledge or action on your part. No HTML or Internet expertise is required.

► WordPress.com (www.wordpress.com)

I used WordPress.com to set up www.litliberation.org from a coffee shop in Bratislava, Slovakia, when a U.S.-based designer flaked out and left me scrambling. It took me less than three hours to learn how to use it and build the site. The site, an experimental educational fundraiser, ended up raising 200%+ more than Stephen Colbert in the same period of time. I also use their free open-sourced version of WordPress (www.wordpress.org, which requires separate hosting) to manage everything for my top-1,000 blog at www.fourhourblog.com. This offers greater customization but requires more management and technical know-how.

Both Weebly and WordPress.com host your site for you, so additional hosting setup isn’t required.

If you choose to use www.wordpress.org (not.com) for greater customizability, I suggest using a hosting service with one-click WordPress installation like www.bluehost.com. The Shopp plug-in (http://shopplugin.net/) or Market Theme plug-in (http://www.markettheme.com/) can then be used to add e-commerce capabilities. Shopify.com (discussed later) is another good all-in-one alternative.

Create Forms in Seconds for Testing Checkout with or Without Payment

► Wufoo (www.wufoo.com)

Wufoo does not offer a full-featured shopping cart, but it provides the cleanest, easiest-to-use forms on the web. Create a checkout page that connects to PayPal and you can (1) link to this checkout page from your site on Weebly, WordPress.com, or elsewhere, or (2) drop the code into your own website and have it hosted there. Wufoo is appropriate for testing and selling single products, as people can't add multiple items to a shopping cart or otherwise customize the order à la Amazon. For those additional options, which are often desirable after successful testing, you will want to use an "end-to-end site solutions" listed later in these resources.

Cost-Effective Trademark Filing and Company Formation (LLC, C-Corp, etc.)

Though I also have a C-Corporation (often used to issue common and preferred stock to investors), created through the second option below, LLCs and S-Corps are generally favored by small businesses. Consult your accountant to determine the best entity form.

► **LegalZoom (www.legalzoom.com)**

Company formation, trademarks, and nearly all legal documents. I know one founder who used this service to incorporate his tech start-up, which is now worth more than $200 million.

► **Corporate Creations (www.corporatecreations.com)**

Domestic and overseas company formation.

Services for Selling Downloadable Products (e-books, videos, audio, etc., in descending order of reader preference)

► **E-Junkie (www.e-junkie.com)**

► **Lulu (www.lulu.com)**

Lulu will also do print-on-demand and other forms of manufacture and fulfillment. Like Lightning Source (www.lightningsource.com), it offers distribution through Amazon, Barnes & Noble online, and other major outlets.

► **CreateSpace (www.createspace.com)**

A subsidiary of Amazon.com that offers inventory-free, physical distribution of books, CD and DVDs on Demand, as well as video downloads through Amazon Video On Demand$^{(\text{tm})}$.

► **Clickbank (** www.clickbank.com **)**
Provides integrated access to affiliates willing to sell your product for a percentage of sales.

Introduction to Pay-Per-Click (PPC) Advertising and Testing

► **Google Adwords (** www.google.com/adwords **)**

Market Sizing and Keyword Suggestion Tools
Brainstorm additional PPC search terms and determine the number of people who are searching for them.

► **Google Adwords Keyword Tool (** http://adwords.google.com/select/KeywordToolExternal **)**
Enter the potential search terms to find search volume and alternative terms with more search traffic. Click on the "Approx Avg Search Volume" column to sort results from most to least searched.

► **SEOBook Keyword Tool, SEO for Firefox Extension (** http://tools.seobook.com / **)**
Outstanding resource page with searches powered by Wordtracker (www.wordtracker.com).

Low-Cost Domain Registration

- ► **Domains in Seconds (** www.domainsinseconds.com **)** I have registered more than 100 domains through this service.
- ► **Joker (** www.joker.com **)**
- ► **GoDaddy (** www.godaddy.com **)**

Inexpensive but Dependable Hosting Services
Shared hosting solutions, where your site is hosted alongside other sites on a single server, are so cheap that I recommend using two providers, one as a primary and one as a backup. Put your site pages on each host and sign up with www.no-ip.com, which can redirect traffic (DNS) to the backup in five minutes instead of the usual 24 to 48 hours.

- ► **1and1 (** www.1and1.com **)**

- ► **BlueHost** (www.bluehost.com)

- ► **RackSpace** (www.rackspace.com ; known for dedicated and managed servers)

- ► Hosting.com (www.hosting.com ; known for dedicated and managed servers)

Royalty-Free Photos and Materials

► **iStockphoto** (www.istockphoto.com)

iStockphoto is the Internet's original member-generated image and design site, which has more than 4 million photographs, vector illustrations, videos, audio tracks, and Flash files available for use.

► **Getty Images** (www.gettyimages.com)

This is where the pros go. Stock photos and film of anything for a price. I pay $150–400 for most images I use in national print campaigns and the quality is outstanding.

E-mail Sign-up Tracking and Scheduled Autoresponders

Both of these programs can be used to embed e-mail address sign-up forms on your site.

- ► **AWeber** (www.aweber.com)

- ► **MailChimp** (www.mailchimp.com)

End-to-End Site Solutions with Payment Processing

► **Shopify** (www.shopify.com)

This is a reader favorite that, in addition to beautiful design, offers full SEO (search-engine optimization), drag-and-drop use, statistics, and product fulfillment through one of their certified partners such as Fulfillment by Amazon.com. Clients range from small-business owners to Tesla Motors. Unlike with Yahoo and eBay, however, you will need to set up a payment-processing service to accept payments from customers. (See below—PayPal is the easiest to integrate.)

► **Yahoo! Store** (http://smallbusiness.yahoo.com/ecommerce) **(866–781–9246)**

This is what Doug of Pro Sound Effects used. As little as $40 a month with 1.5% per transaction.

► **eBay Store (http://pages.ebay.com/storefronts/start.html)**

From $15–500 per month, plus eBay fees.

Simple Payment Processing for Testing Pages, from Least to Most Involved

►**PayPal Cart (www.paypal.com;** see "merchant")

Accept credit card payments in minutes. No monthly fees, 1.9–2.9% of each transaction (called "discount rate") and $0.30 per transaction.

► **Google Checkout (http://checkout.google.com/sell)**

Get $10 in free processing for each $1 spent on AdWords; 2% and $0.20 per transaction thereafter. Requires that customers have a Google ID, and is thus most useful as a supplement to one of the aforementioned payment solutions. Be sure to link your Checkout account to your AdWords account to receive credit. Important note: free transaction processing for nonprofits.

► **Authorize.net (www.authorize.net)**

The Authorize.Net Payment Gateway can help you accept credit card and electronic check payments quickly and affordably. More than 230,000 merchants trust Authorize.net to manage their transactions, help prevent fraud, and grow their business. The fees per transaction are lower than PayPal or Google Checkout, but setup will require a merchant account, covered in the next chapter, and other time-consuming applications. I suggest setting up Authorize.net only after a product has tested successfully through one of the other two options above.

Software for Understanding Web Traffic (Web Analytics)

How are people finding, browsing, and leaving your site? How many prospective customers are being delivered by each PPC ad, and which pages are most popular? These programs tell you all this and more. Google is free for most low-volume sites—and better than a lot of paid software-and the others cost $30 and upward per month.

► **Google Analytics (www.google.com/analytics)**

► **CrazyEgg (www.crazyegg.com)**

I use CrazyEgg to see exactly where people are clicking most and least on homepages and landing pages. It is particularly helpful for repositioning the most important links or buttons to help prompt visitors to take specific next actions. Don't guess what's working or not—measure it.

►**Clicktracks (www.clicktracks.com)**

► **WebTrends (www.webtrends.com)**

A/B Testing Software

Testing is, as you know, the name of the game, but testing all the variables can be confusing. How do you know which combination of headlines, text, and images on your homepage results in the most sales? Instead of using one version for a bit, then alternating, which is time-consuming, use software that serves up different versions to prospects at random, then does the math for you.

► **Google Website Optimizer (WO) (http://www.google.com/websiteoptimizer)**

This is a free tool that, like Google Analytics, is better than most paid services. I used Google WO to test three potential homepages for www.dailyburn.com and increased sign-ups 19%, then again by more than 16%.

- ► **Offermatica (www.offermatica.com)**
- ► Vertster.com (www.vertster.com)
- ► Optimost (www.optimost.com)

Low-Cost Toll-free Numbers

►**TollFreeMAX (www.tollfreemax.com) (877–888–8MAX)** and **Kall8 (www.kall8.com)**

TollFreeMAX and Kall8 both allow you to set up toll-free numbers in 2–5 minutes. Calls can then be forwarded to any other numbers, and voicemail and statistics can be managed online or via e-mail.

Checking Competitive Site Traffic

Want to see how much traffic your competition is getting and who is linking to them?

- ► **Compete (www.compete.com)**
- ► **Quantcast (www.quantcast.com)**
- ► **Alexa (www.alexa.com)**

Freelance Designers and Programmers

►**99Designs** (**www.99designs.com**) and **Crowdspring** (**www.crowdspring.com**)

I used 99Designs to get an excellent logo for www.litliberation.org in 24 hours for less than $150. I submitted the concept, more than 50 designers worldwide uploaded their best attempts, which I could browse, and I chose the best after suggesting a few improvements. From Crowdspring's site: "Name your price, name your deadline, see entries within hours and be done in just days. The average project gets a whopping 68 entries. 25 entries or your money back."

- ► **eLance (www.elance.com) (877–435–2623)**

- ► **Craigslist (www.craigslist.org)**

► LIFESTYLE DESIGN IN ACTION

I'm a U.S. citizen and it was impossible for my friends and relatives to track me down by phone. Enter Skype In. It's not new but allows you to lease a fixed U.S. (or other country) phone number which then forwards to your Skype account. About $60/year. Within Skype you can then set up call forwarding to ring you at your local number. You pay the rate as if you were calling from the United States to wherever you are. I've used this in about 40 countries and it works like a treat. The call quality is usually great and the convenience is amazing. http://www.skype.com/allfeatures/onlinenumber/. A caveat is to always, ALWAYS get a local SIM card for your unlocked GSM phone. Roaming is for amateurs. A local SIM also gets you GPRS, Edge, or 3G. Sometimes even free Wifi. Cheers, ***—TY KROLL***

• • •

Basically I try to keep all of my tools online so that if my laptop gets stolen, I can buy a new one and have everything up and running within 24 hours. Here are a few of the tools I use on a regular basis:

- RememberTheMilk.com has been really crucial to me keeping on top of my daily tasks.
- Freshbooks.com for online invoicing
- Highrise (http://www.highrisehq.com/) for online CRM
- Dropbox (getdropbox.com) for easy file sharing/automatic backup of critical files while on the road
- TrueCrypt (truecrypt.org) for keeping your laptop data secure while on the road. *[Tim comment: This can also be used with a USB flash drive, and another cool feature—it provides two levels of "plausible deniability" (hidden volumes, etc.) if someone forces you to reveal the password.]*
- PBwiki.com-Wiki site that helps me keep on top of the notes and ideas that I collect as I go through life.
- FogBugz on Demand: http://www.fogcreek.com/FogBUGZ/IntrotoOnDemand.html. It's a "bug tracker" aimed at software development companies, but I use it every day for both personal and business tasks. It's almost like a VA, as you can route your mail through it and it will help you sort it and keep track of it. It has great features to track e-mails, and there's a free version for two users (me + VA!). ***—RB CARTER***

• • •

A really useful service is Amazon's Mechanical Turk. With a small investment in time or money, a business that requires hundreds of people doing small bits of defined work becomes possible for extraordinarily low work-per-unit costs. Examples include the search for Steve Fosset (literally thousands of people looked at satellite photos that would have overwhelmed SAR agencies) and a trouble-ticket business that utilizes qualified labor all over the world (see Amazon.com/webservices). I am not an owner nor do I have any stake in Amazon—but I have used their services and some are trans forming when it comes to muse creation. Cheers, ***—J MARYMEE***

• • •

FAST TO MARKET

The fastest way to market with a product idea is: Registera.com. Get hosting from dathorn.com [a cheap reseller account, like www.domainsinseconds.com]. With two clicks set up a wordpress blog. Apply a theme to it. Add your content and a buy now button. The buy now button links to an enter e-mail address, phone number, etc., page. The user then clicks a continue to PayPal button. This automatically e-mails me their details, but then shows the user a message stating that the link to PayPal is currently not working. I use this to determine how many sales I would have achieved. I use Google ads to drive traffic … I calculate theoretical ROI (ideally using Google analytics). If after a week or two I can see a positive ROI that's worth my effort I create or outsource the creation of the product (emag, PDF, whatever). I set it all up with a working link to PayPal, and then retrospectively send a message to the users who already tried to buy. Normally within hours I've got all my money back, and the cash starts to roll. An example is the DIY public relations pack at www.mybusinesspr.com.au. Great work of the 4HWW … looking forward to the next edition. Regards, ***MATT SCHMIDT***

39. http://news.com.com/2100–1017–269594.html?legacy=cnet.

40. It can be illegal to charge customers prior to shipment—so we will not charge customers—but it is still common practice. Why do so many commercials state "allow three to four weeks for delivery" if it only takes three to five days for a shipment to get from New York to California? It gives the companies time to manufacture product and use customers' credit card payments to finance it. Clever but often against the law.

41. This applies to Sherwood and not Johanna.

42. How did I come up with the most successful BodyQUICK headline ("The Fastest Way to Increase Power and Speed Guaranteed")? I borrowed it from the longest-running, and thus most profitable, Rosetta Stone headline: "The Fastest Way to Learn a Language Guaranteed.(tm)" Reinventing the wheel is expensive—become an astute observer of what is already working and adapt it. I keep a folder of all print and direct mail advertising that compels me to call a number or visit a website, and I use www.delicious.com to bookmark websites that convince me to provide my e-mail address or make a purchase.

43. Sherwood includes shipping and handling prior to the final order page so that people don't finalize the order just to confirm total pricing. He wants his "orders" to reflect real orders and not price checkers.

44. If you are rolling out after a successful test or building a large e-mail database, tools like www.aweber.com in the resources are better at scaling.

45. Keeping in mind that 100 specific terms at $0.10 per click will perform better than 10 broad terms

at $1.00 per click, the more you spend, and thus the more traffic you drive, the more statistically valid the results will be. If budget permits, increase the number of related terms and daily expenditure so that the entire PPC test costs $500–1,000.

46. This is a checking account for receiving credit card payments.

47. Set this up using services detailed at the end of this chapter and the next.

48. See the online bonus chapter on www.fourhourblog.com to understand all of these terms in context. Search “Jedi Mind Tricks.”

49. “Paper trading” refers to setting an imaginary budget, “purchasing” stocks (writing their current values on a piece of paper), and then tracking their performance over time to see how your investment would have done had it been for real. It is a no-risk method for honing investment skills before putting skin in the game.

⑪

Income Autopilot III

► MBA—MANAGEMENT BY ABSENCE

> The factory of the future will have only two employees, a man and a dog. The man will be there to feed the dog. The dog will be there to keep the man from touching the equipment.
>
> —WARREN G. BENNIS, University of Southern California Professor of Business Administration; adviser to Ronald Reagan and John F. Kennedy

Most entrepreneurs don’t start out with automation as a goal. This leaves them open to mass confusion in a world where each business guru contradicts the next. Consider the following:

> A company is stronger if it is bound by love rather than by fear.… If the employees come first, then they’re happy.
>
> —HERB KELLEHER, cofounder of Southwest Airlines

> Look, kiddie. I built this business by being a bastard. I run it by being a bastard. I’ll always be a bastard, and don’t you ever try to change me.[50]
>
> —CHARLES REVSON, founder of Revlon, to a senior executive within his company

Hmm … Whom to follow? If you are fast on your feet, you’ll notice that I just offered you an either-or option. The good news is that, as usual, there is a third option.

The contradictory advice you find in business books and elsewhere usually relates to managing employees—how to handle the human element. Herb tells you to give them a hug, Revson tells you to kick them in the balls, and I tell you to solve the problem by eliminating it altogether: Remove the human element.

Once you have a product that sells, it’s time to design a self-correcting business architecture that runs itself.

The Remote-Control CEO

> The power of hiding ourselves from one another is mercifully given, for men are wild beasts, and would devour one another but for this protection.
>
> —HENRY WARD BEECHER, U.S. abolitionist and clergyman, “Proverbs from Plymouth Pulpit”

RURAL PENNSYLVANIA

In a 200-year-old stone farmhouse, a quiet “experiment in 21st-century leadership” is proceeding exactly as planned.[51] Stephen McDonnell is upstairs in his flip-flops looking at a spreadsheet on his computer. His company has increased its annual revenue 30% per year since it all began, and he is able to spend more time with his three daughters than he ever thought possible.

The experiment? As CEO of Applegate Farms, he insists on spending just one day per week at the company headquarters in Bridgewater, New Jersey. He’s not the only CEO who spends time at home, of course—there are hundreds who have heart attacks or nervous breakdowns and need time to recover—but there is a huge difference. McDonnell has been doing it for more than 17 years. Rarer still, he started doing it just six months after founding the company.

This intentional absence has enabled him to create a process-driven instead of founder-driven business. Limiting contact with managers forces the entrepreneur to develop operational rules that enable others to deal with problems themselves instead of calling for help.

This isn’t just for small operations. Applegate Farms sells more than 120 organic and natural meat products to high-end retailers and generates more than $35 million in revenue per year.

It is all possible because McDonnell started with the end in mind.

Behind the Scenes: The Muse Architecture

> Orders are nobody can see the Great Oz! Not nobody, not nohow!
>
> —GUARDIAN OF THE EMERALD CITY GATES, *The Wizard of Oz*

Starting with the end in mind—an organizational map of what the eventual business will look like—is not new.

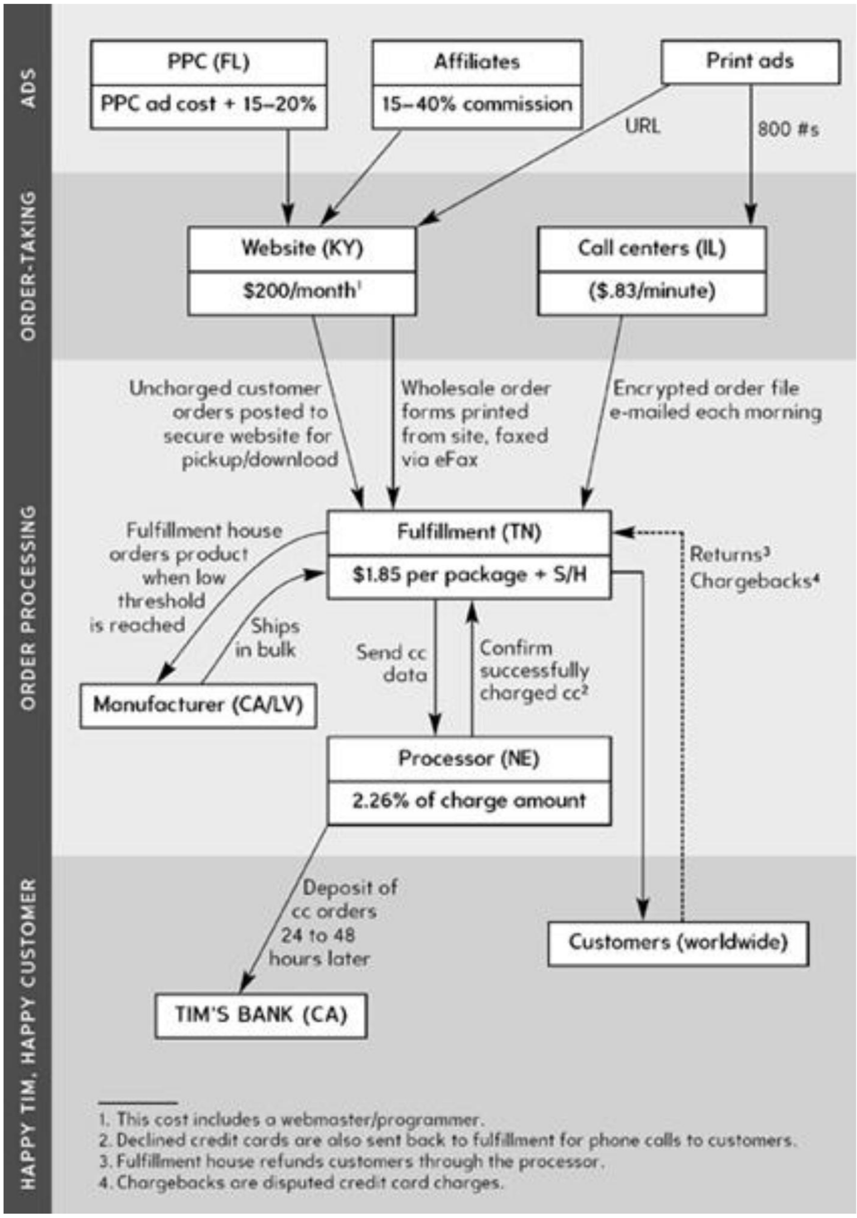
Infamous deal-maker Wayne Huizenga copied the org chart of McDonald’s to turn Blockbuster into a billion-dollar behemoth, and dozens of titans have done much the same. In our case, it’s the “end in mind” that is different. Our goal isn’t to create a business that is as large as possible, but rather a business that bothers us as little as possible. The architecture has to place us out of the information flow instead of putting us at the top of it.

I didn't get this right the first time I tried.

In 2003, I was interviewed in my home office for a documentary called *As Seen on TV*. We were interrupted every 20–30 seconds with beeping e-mail notifications, IM pings, and ringing phones. I couldn't leave them unanswered, because dozens of decisions depended on me. If I didn't ensure the trains were running on time and put out the fires, no one would.

The Anatomy of Automation

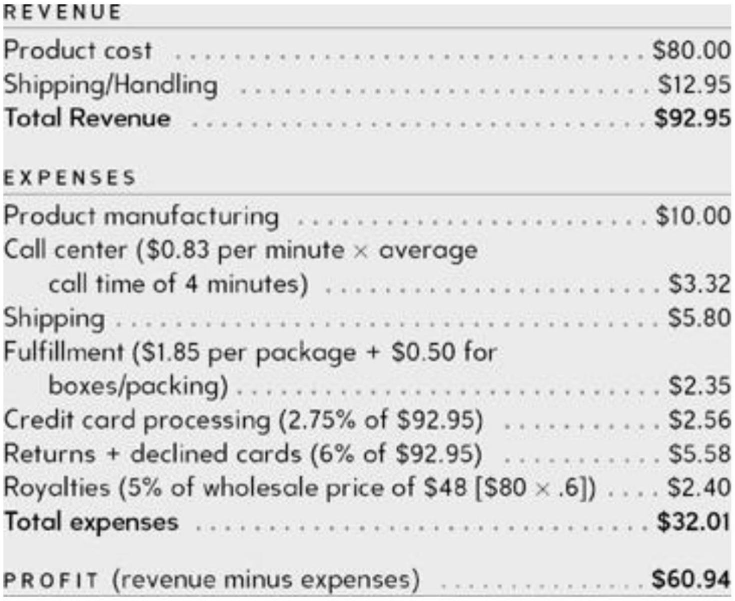
THE 4-HOUR WORKWEEK VIRTUAL ARCHITECTURE


ADS
ORDER-TAKING
ORDER PROCESSING
HAPPY TIM, HAPPY CUSTOMER
PPC (FL)
PPC ad cost + 15–20%
Affiliates
15–40% commission
Print ads
URL
800 #s
Website (KY)
$200/month¹
Call centers (IL)
($.83/minute)
Uncharged customer orders posted to secure website for pickup/download
Wholesale order forms printed from site, faxed via eFax
Encrypted order file e-mailed each morning
Fulfillment (TN)
$1.85 per package + S/H
Returns³
Chargebacks⁴
Fulfillment house orders product when low threshold is reached
Ships in bulk
Manufacturer (CA/LV)
Send cc data
Confirm successfully charged cc²
Processor (NE)
2.26% of charge amount
Deposit of cc orders 24 to 48 hours later
Customers (worldwide)
TIM'S BANK (CA)

1. This cost includes a webmaster/programmer.
2. Declined credit cards are also sent back to fulfillment for phone calls to customers.
3. Fulfillment house refunds customers through the processor.
4. Chargebacks are disputed credit card charges.

Splitting the Pie: Outsourcer Economics

Each outsourcer takes a piece of the revenue pie. Here is what the general profit-loss might look like for a hypothetical $80 product sold via phone and developed with the help of an expert, who is paid a royalty. I recommend calculating profit margins using higher-than-anticipated expenses. This will account for unforeseen costs (read: screwups) and miscellaneous fees such as monthly reports, etc.



REVENUE	
Product cost	$80.00
Shipping/Handling	$12.95
Total Revenue	**$92.95**
EXPENSES	
Product manufacturing	$10.00
Call center ($0.83 per minute × average call time of 4 minutes)	$3.32
Shipping	$5.80
Fulfillment ($1.85 per package + $0.50 for boxes/packing)	$2.35
Credit card processing (2.75% of $92.95)	$2.56
Returns + declined cards (6% of $92.95)	$5.58
Royalties (5% of wholesale price of $48 [$80 × .6])	$2.40
Total expenses	**$32.01**
PROFIT (revenue minus expenses)	**$60.94**

How do you factor in advertising cost? If a $1,000 ad or $1,000 in PPC produces 50 sales, my advertising cost per order (CPO) is $20. *This makes the actual‘ per-unit profit **$40.94***.

I set a new goal after that experience, and when I was interviewed six months later as a follow-up, one change was more pronounced than all others: silence. I had redesigned the business from the ground up so that I had no phone calls to answer and no e-mail to respond to.

I'm often asked how big my company is—how many people I employ full-time. The answer is one. Most people lose interest at that point. If someone were to ask me how many people run BrainQUICKEN LLC, on the other hand, the answer is different: between 200 and 300. I am the ghost in the machine.[52]

From advertisements—print in this example—to a cash deposit in my bank account, the diagram is what a simplified version of my architecture looks like, including some sample costs. If you have developed a product based on the guidelines in the last two chapters, it will plug into this structure hand-in-glove.

Where am I in the diagram? Nowhere.

I am not a tollbooth through which anything needs to pass. I am more like a police officer on the side of the road who can step in if need be, and I use detailed reports from outsourcers to ensure the cogs are moving as intended. I check reports from fulfillment each Monday and monthly reports from the same the first of each month. The latter reports include orders received from the call center, which I can compare to the call center bills to gauge profit. Otherwise, I just check bank accounts online on the first and fifteenth of each month to look for odd deductions. If I find something, one e-mail will fix it, and if not, it's back to kendo, painting, hiking, or whatever I happen to be doing at the time.

Removing Yourself from the Equation: When and How

The system is the solution.

—AT&T

The diagram should be your rough blueprint for designing a self-sustaining virtual architecture. There could be differences—more or fewer elements—but the main principles are the same:

1. Contract outsourcing companies[53] that specialize in one function vs. freelancers whenever possible so that if someone is fired, quits, or doesn't perform, you can replace them without interrupting your business. Hire trained groups of people who can provide detailed reporting and replace one another as needed.
2. Ensure that all outsourcers are willing to communicate among themselves to solve problems, and *give them written permission to make most inexpensive decisions without consulting you first* (I started at less than $100 and moved to $400 after two months).

How do you get there? It helps to look at where entrepreneurs typically lose their momentum and stall permanently.

Most entrepreneurs begin with the cheapest tools available, bootstrapping and doing things themselves to get up and running with little cash. This isn't the problem. In fact, it's necessary so that the entrepreneurs can train outsourcers later. The problem is that these same entrepreneurs don't know when and how to replace themselves or their homemade infrastructure with something more **scalable**.

By "scalable," I mean a business architecture that can handle 10,000 orders per week as easily as it can handle 10 orders per week. Doing this requires minimizing your decision-making responsibilities, which achieves our goal of time freedom while setting the stage for doubling and tripling income with no change in hours worked.

Call the companies at the end of the chapter to research costs. Plan and budget accordingly to upgrade infrastructure at the following milestones, which I measure in units of product shipped:

Phase I: 0–50 Total Units of Product Shipped

Do it all yourself. Put your phone number on the site for both general questions and order-taking—this is important in the beginning—and take customer calls to determine common questions that you will answer later in an online FAQ. This FAQ will also be the main material for training phone operators and developing sales scripts.

Is PPC, an offline advertisement, or your website too vague or misleading, thus attracting unqualified and time-consuming consumers? If so, change them to answer common questions and make the product benefits (including what it isn't or doesn't do) clearer.

Answer all e-mail and save your responses in one folder called "customer service questions." CC yourself on responses and put the nature of the customers' questions in the subject lines for future indexing. Personally pack and ship all product to determine the cheapest options for both. Investigate opening a merchant account from your local small bank (easier to get than with a larger bank) for later outsourced credit card processing at higher roll-out volumes.

Phase II: >10 Units Shipped Per Week

Add the extensive FAQ to your website and continue to add answers to common questions as received. Find local fulfillment companies in the yellow pages under “fulfillment services” or “mailing services.” If you cannot find one there or at www.mfsanet.org, call local printers and ask them for recommendations. Narrow the field to those (often the smallest) who will agree not to charge you setup fees and monthly minimums. If this isn’t possible, ask for at least 50% off both and then request that the setup fee be applied as an advance against shipping or their other fees.

Limit the candidates further to those who can respond to order status e-mail (ideal) or phone calls from customers. The e-mail from your “customer service” folder will be provided as copy-and-paste responses, especially those related to order status and refund requests.[54]

To lower or eliminate miscellaneous fees, explain that you are a start-up and that your budget is small. Tell them you need the cash for advertising that will drive more shipments. If needed, mention the competitive companies that you are considering and pit them against one another, using lower pricing or concessions from one to get larger discounts and bonuses from the others.

Before making your final selection, ask for at least three client references and use the following to elicit the negatives: “I understand they’re good, but everyone has weaknesses. If you had to point out where you’ve had some issues and what they’re not the best at, what would you say? Can you please describe an incident or a disagreement? I expect these with all companies, so it’s no big deal, and it’s confidential, of course.”

Ask for “net-30 terms”—payment for services 30 days after they’re rendered—after one month of prompt payment for their services. It is easier to negotiate all of the above points with smaller operations that need the business. Have your contract manufacturer ship product directly to the fulfillment house once you have decided on one and put the fulfillment house’s e-mail (you can use an e-mail address at your domain and forward it) or phone number on the online “thank you” page for order status questions.

Phase III: >20 Units Shipped Per Week

Now you will have the cash flow to afford the setup fees and the monthly minimums that bigger, more sophisticated outsourcers will ask for. Call the end-to-end fulfillment houses that handle it all—from order status to returns and refunds. Interview them about costs and ask them for referrals to call centers and credit card processors they’ve collaborated with for file transfers and problem solving. Don’t assemble an architecture of strangers—there will be programming costs and mistakes, both of which are expensive.

Set up an account with the credit card processor first, for which you will need your own merchant account. This is critical, as the fulfillment house can only handle refunds and declined cards for transactions they process themselves through an outsourced credit card processor.

Optionally, set up an account with one of the call centers your new fulfillment center recommends. These will often have toll-free numbers you can use instead of purchasing your own. Look at the percentage split of online to phone orders during testing and consider carefully if the extra revenue from the latter is worth the hassle. It often isn’t. Those who call to order will generally order online if given no other option.

Before signing on with a call center, get several 800 numbers they answer for current clients and make test calls, asking difficult product-related questions and gauging sales abilities. Call each number at least three times (morning, afternoon, and evening) and note the make-or-break factor: wait time. The phone should be answered within three to four rings, and if you are put on hold, the shorter the wait the better. More than 15 seconds will result in too many abandoned calls and waste advertising dollars.

The Art of Undecision: Fewer Options = More Revenue

> Companies go out of business when they make the wrong decisions or, just as important, make too many decisions. The latter creates complexity.
>
> —MIKE MAPLES, cofounder of Motive Communications (IPO to $260 million market cap), founding executive of Tivoli (sold to IBM for $750 million), and investor in companies such as Digg.com

Joseph Sugarman is the marketing genius behind dozens of direct-response and retail successes, including the BluBlocker sunglasses phenomenon. Prior to his string of home runs on television (he sold 20,000 pairs of BluBlockers within 15 minutes of his first QVC appearance), his domain was print media, where he made millions and built an empire called JS&A Group. He was once recruited to design an advertisement for a manufacturer's watch line. The manufacturer wanted to feature nine different watches in the ad, and Joe recommended featuring just one. The client insisted and Joe offered to do both and test them in the same issue *of The Wall Street Journal*. The result? The one-watch offer outsold the nine-watch offer 6-to-1.[55]

Henry Ford once said, referring to his Model-T, the bestselling car of all time,[56] "The customer can have any color he wants, so long as it's black." He understood something that businesspeople seem to have forgotten: Serving the customer ("customer service") is not becoming a personal concierge and catering to their every whim and want. Customer service is providing an excellent product at an acceptable price and solving legitimate problems (lost packages, replacements, refunds, etc.) in the fastest manner possible. That's it.

The more options you offer the customer, the more indecision you create and the fewer orders you receive—it is a disservice all around. Furthermore, the more options you offer the customer, the more manufacturing and customer service burden you create for yourself.

The art of "undecision" refers to minimizing the number of decisions your customers can or need to make. Here are a few methods that I and other **NR** have used to reduce service overhead 20–80%:

1. Offer one or two purchase options ("basic" and "premium," for example) and no more.
2. Do not offer multiple shipping options. Offer one fast method instead and charge a premium.
3. Do not offer overnight or expedited shipping *(it is possible to refer them to a reseller who does, as is true with all of these points)*, as these shipping methods will produce hundreds of anxious phone calls.
4. Eliminate phone orders completely and direct all prospects to online ordering. This seems outrageous until you realize that success stories like Amazon.com have depended on it as a fundamental cost-saver to survive and thrive.
5. Do not offer international shipments. Spending 10 minutes per order filling out customs forms and then dealing with customer complaints when the product costs 20–100% more with tariffs and duties is about as fun as headbutting a curb. It's about as profitable, too.

Some of these policies hint at what is perhaps the biggest time-saver of all: customer filtering.

Not All Customers Are Created Equal

Once you reach Phase III and have some cash flow, it's time to re-evaluate your customers and thin the herd. There are good and bad versions of all things: good food, bad food; good movies, bad movies; good sex, bad sex; and, yes, good customers and bad customers.

Decide now to do business with the former and avoid the latter. I recommend looking at the customer as an equal trading partner and not as an infallible blessing of a human being to be pleased at all costs. If you offer an excellent product at an acceptable price, it is an equal trade and not a begging session between subordinate (you) and superior (customer). Be professional but never kowtow to unreasonable people.

Instead of dealing with problem customers, I recommend you prevent them from ordering in the first place.

I know dozens of **NR** who don't accept Western Union or checks as payment. Some would respond to this with, "You're giving up 10–15% of your sales!" The **NR**, in turn, would say, "I am, but I'm also avoiding the 10–15% of the customers who create 40% of the expenses and eat 40% of my time." It's classic 80/20.

Those who spend the least and ask for the most before ordering will do the same after the sale. Cutting them out is both a good lifestyle decision and a good financial decision. Low-profit and high-maintenance customers like to call operators and spend up to 30 minutes on the phone asking questions that are unimportant or answered online, costing—in my case—$24.90 (30 **x** $0.83) per 30-minute incident, eliminating the minuscule profit they contribute in the first place.

Those who spend the most complain the least. In addition to our premium $50–200 pricing, here are a few additional policies that attract the high-profit and low-maintenance customers we want:

1. Do not accept payment via Western Union, checks, or money order.
2. Raise wholesale minimums to 12–100 units and require a tax ID number to qualify resellers who are real businesspeople and not time-intensive novices. Don't run a personal business school.
3. Refer all potential resellers to an online order form that must be printed, filled out, and faxed in. Never negotiate pricing or approve lower pricing for higher-volume orders. Cite "company policy" due to having had problems in the past.
4. Offer low-priced products (à la MRI's NO2 book) instead of free products to capture contact information for follow-up sales. Offering something for free is the best way to attract time-eaters and spend money on those unwilling to return the favor.
5. Offer a **lose-win guarantee** (see boxed text) instead of free trials.
6. Do not accept orders from common mail fraud countries such as Nigeria.

Make your customer base an exclusive club, and treat the members well once they've been accepted.

The Lose-Win Guarantee—How to Sell Anything to Anyone

> If you want a guarantee, buy a toaster.
>
> —CLINT EASTWOOD

The 30-day money-back guarantee is dead. It just doesn't have the pizzazz it once did. If a product doesn't work, I've been lied to and will have to spend an afternoon at the post office to return it. This just isn't enough.

This is where we enter the neglected realm of **lose-win** guarantees and risk reversal. The **NR** use what most consider an afterthought—the guarantee—as a cornerstone sales tool.

The **NR** aim to make it profitable for the customer even if the product fails. Lose-win guarantees not only remove risk for the consumer but put the company at financial risk.

Here are a few examples of putting your money where your mouth is.

Delivered in 30 minutes or less or it's free!
(Domino's Pizza built its business on this guarantee.)

We're so confident you'll like CIALIS, if you don't we'll pay for the brand of your choice.
(The "CIALIS® Promise Program" offers a free sample of CIALIS and then offers to pay for competing products if CIALIS doesn't live up to the hype.)

If your car is stolen, we'll pay $500 of your insurance deductible.
(This guarantee helped THE CLUB become the #1-selling mechanical automobile anti-theft device in the world.)

110% guaranteed to work within 60 minutes of the first dose.
(This was for BodyQUICK and a first among sports nutrition products. I offered to not only refund customers the price of the product if it didn't work within 60 minutes of the *first dose*, but also to send them a check for 10% more.)

The lose-win guarantee might seem like a big risk, especially when someone can abuse it for profit like in the BodyQUICK example, but it isn't … *if* your product delivers. Most people are honest.

Let's look at some actual numbers.

Returns for BodyQUICK, even with a 60-day return period (and partially because of it[57]), are less than 3% in an industry in which the average is 12–15% for a normal 30-day 100% money-back guarantee. Sales increased more than 300% within four weeks of introducing the 110% guarantee, and returns decreased overall.

Johanna adopted this lose-win offer and came up with "Increase sport-specific flexibility 40% in two weeks or return it for a full refund (including shipping) and keep the 20-minute bonus DVD as our gift."

Sherwood found his guarantee as well: "If these shirts are not the most comfortable you've ever worn, return them and get 2-times your purchase price back. Each shirt is also guaranteed for life—if it gets threadbare, send it back and we'll replace it free of charge."

Both of them increased sales more than 200% in the first two months. Return percentage remained the same for Johanna and increased 50% for Sherwood, from 2 to 3%. Disaster? Far from it. Instead of selling 50 and getting one back with a 100% guarantee [(50 **x** $100) – $100 = $4,900 in revenue], he sold 200 and got six back with the 200% guarantee [(200 **x** $100) – (6 **x** $200) = $18,800 in revenue]. I'll take the latter.

Lose-win is the new win-win. Stand out and reap the rewards.

Little Blue Chip: How to Look Fortune 500 in 45 Minutes

Are you tired of sand being kicked in your face? I promise you new muscles in days!

—CHARLES ATLAS, strongman who sold more than $30 million worth of "dynamic-tension" muscle courses through comic books

If approaching large resellers or potential partners, small company size will be an obstacle. This discrimination is often as insurmountable as it is unfounded. Fortunately, a few simple steps can dramatically upgrade your budding Fortune 500 image and take your muse from coffee shop to boardroom in 45 minutes or less.

1. Don't be the CEO or founder.
Being the "CEO" or "Founder" screams start-up. Give yourself the mid-level title of "vice president" (VP), "director," or something similar that can be added to depending on the occasion (Director of Sales, Director of Business Development, etc.). For negotiation purposes as well, remember that it is best *not* to appear to be the ultimate decision-maker.

2. Put multiple e-mail and phone contacts on the website.
Put various e-mail addresses on the "contact us" page for different departments, such as "human resources," "sales," "general inquiries," "wholesale distribution," "media/PR," "investors," "web comments," "order status," and so on. In the beginning, these will all forward to your e-mail address. In Phase III, most will forward to the appropriate outsourcers. Multiple toll-free numbers can be used in the same fashion.

3. Set up an Interactive Voice Response (IVR) remote receptionist.
It is possible to sound like a blue chip for less than $30. In fewer than ten minutes on a site such as www.angel.com, which boasts clients such as Reebok and Kellog's, it is possible to set up an 800 number that greets callers with a voice prompt such as, "Thank you for calling [business name]. Please say the name of the person or department you would like to reach or just hold on for a list of options."

Upon speaking your name or selecting the appropriate department, the caller is forwarded to your preferred phone or the appropriate outsourcer—with on-hold music and all.

4. Do not provide home addresses.
Do not use your home address or you will get visitors. Prior to securing an end-to-end fulfillment house that can handle checks and money orders—if you decide to accept them—use a post office box but leave out the "PO Box" and include the street address of the post office itself. Thus "PO Box 555, Nowhere, US 11936" becomes "Suite 555, 1234 Downtown Ave., US 11936."

Go forth and project professionalism with a well-designed image. *Perceived* size does matter.

► COMFORT CHALLENGE

Relax in Public (2 days)

This is the last Comfort Challenge, placed prior to the chapter that tackles the most uncomfortable turning point for most office dwellers: negotiating remote work agreements. This challenge is intended to conventions. There are no legal boundaries stopping you from creating an ideal life … or just being self-entertained and causing mass confusion.

So, relaxing in public. Sounds easy, right? I'm somewhat famous for relaxing in style to get a laugh out of friends. Here is the deal, and I don't care if you're male or female, 20 or 60, Mongolian or Martian. I call the following a "time-out."

Once per day for two days, simply lie down in the middle of a crowded public place at some point. Lunchtime is ideal. It can be a well-trafficked sidewalk, the middle of a popular Starbucks, or a popular bar. There is no real technique involved. Just lie down and remain silent on the ground for about ten seconds, and then get up and continue on with whatever you were doing before. I used to do this at nightclubs to clear space for break-dancing circles. No one responded to pleading, but going catatonic on the ground did the trick.

Don't explain it at all. If someone asks about it after the fact (he or she will be too confused to ask you while you're doing it for 10 seconds), just respond, "I just felt like lying down for a second." The less you say, the funnier and more gratifying this will be. Do it on solo missions for the first two days, and then feel free to do it when with a group of friends. It's a riot.

It isn't enough to think outside the box. Thinking is passive. Get used to acting outside the box.

► TOOLS AND TRICKS

Looking Huge—Virtual Receptionist and IVR

► Angel (www.angel.com)

Get an 800 number with professional voice menu (voice recognition departments, extensions, etc.) in five minutes. Incredible.

► Ring Central (www.ringcentral.com)

Offers toll-free numbers, call screening and forwarding, voicemail, fax send and receive, and message alerts, all online.

CD/DVD Duplication, Printing, and Product Packaging

► AVC Corporation (www.avccorp.com)

► SF Video (www.sfvideo.com)

Local Fulfillment (fewer than 20 units shipped per week)

► Mailing Fulfillment Service Association (www.mfsanet.org)

End-to-End Fulfillment Companies (more than 20 units shipped per week, $500+ setup)

► **Motivational Fulfillment (www.mfpsinc.com)**

The secret backend to campaigns from HBO, PBS, Comic Relief, Body by Jake, and more.

► **Innotrac (www.innotrac.com)**

They are currently one of the largest DR marking companies.

► **Moulton Fulfillment (www.moultonfulfillment.com)**

200,000-square-foot facility with real-time online inventory reports.

Call Centers (per-minute and/or per-sale fees)

There are generally two classes of call centers: order takers and commissioned reps. Interview each provider you consider to understand the options and costs involved.

The former is a good option if you give the product price in an advertisement (hard offer), are offering free information (lead generation), or don't need trained salespeople who can overcome objections. In other words, your ad or website is pre-qualifying prospects.

The latter would more appropriately be called "sales centers." Operators are commissioned and trained "closers" whose sole goal is to convert callers to buyers. These calls are often in response to "call for information/ trial/sample" ads that don't feature a price (soft offers). Expect higher costs per sale.

► **LiveOps (www.liveops.com)**

Pioneer in home-based reps, which often ensures more calls are answered. Provides comprehensive service with agents, IVR, and Spanish. Often used for one-step order taking instead of soft offers.

► **West Teleservices (www.west.com)**

29,000 employees worldwide, processes billions of minutes per year. All the high-volume and low-price players use them for lower-priced products or higher-end products with free trials and installment plans.

► **NexRep (www.nexrep.com)**

Highly skilled home-based sales agents that specialize in B2C and B2B, inbound and outbound programs. If performance, speed to respond, Internet integration, and quality customer experience are your priorities, this is a strong option to consider.

► **Triton Technology (www.tritontechnology.com)**

Commission-only sales center know for incredible closing abilities (see the movie *Boiler Room* and Alec Baldwin's character in *Glengarry, Glen Ross)*. Don't call unless your product sells for at least $100.

► **CenterPoint Teleservices (http://www.centerpointllc.com)**

This sales force has experience to convert sales from hard offers, soft offers, and multiple offers (upselling additional products after a caller agrees to purchase the advertised product) originating from radio, TV, print, or the web.

► **Stewart Response Group (www.stewartresponsegroup.com)**

Sales-driven call center leveraging the home-agent model for both inbound and outbound programs. Another high-touch boutique center.

Credit Card Processors (merchant account through your bank necessary)

These companies, unlike options in the last chapter, specialize in not only processing credit cards but interacting with fulfillment on your behalf, removing you from the flowchart.

► **TransFirst Payment Processing (www.transfirst.com)**

► **Chase Paymentech (www.paymentech.com)**

► **Trust Commerce (www.trustcommerce.com)**

► **PowerPay (www.powerpay.biz)**

One of the Inc. 500 Fastest-Growing Private Companies. Process credit cards from your iPhone and more.

Affiliate Program Software

► **My Affiliate Program (www.myaffiliateprogram.com)**

Also see the affiliate programs listed in the "Tools and Tricks" at the end of Chapter 9.

Discount Media Buying Agencies

If you go to a magazine, radio station, or TV channel and pay rate card—the "retail" pricing first given—you will never make it big. To save a lot of headache and expense, consider using ad agencies that negotiate discounts of up to 90% in their chosen media.

► **Manhattan Media (Print) (www.manhmedia.com)**
Great agency with fast turnaround. I’ve used them since the beginning.

► **Novus Media (Print) (www.novusprintmedia.com)**
Relationships with 1,400+ magazine and newspaper publishers with an average of 80% of rate card. Clients include Sharper Image and Office Depot.

► **Mercury Media (TV) (www.mercurymedia.com)**
Largest private DR media agency in the U.S. Specialists in TV but can also handle radio and print. Offer full tracking and reporting to determine ROI.

► **Euro RSCG (Cross Media) (http://www.eurorscgedge.com /)**
One of the worldwide leaders in DRTV media across all platforms.

► **Canella Media Response Television (TV) (http://www.drtv.com)**
Uses the innovative P/I (per inquiry) model for compensation, where you split order profits instead of paying for time upfront. This is more expensive per order if you have a successful campaign, but it lowers upfront investment in media.

► **Marketing Architects (Radio) (www.marketingarchitects.com)**
The de facto leaders in radio DR but a bit on the expensive side. Almost all of the most successful DR products—Carlton Sheets No Money Down, Tony Robbins, etc.—have used them.

► **Radio Direct Response (Radio) (www.radiodirect.com)**
Mark Lipsky has put together a great firm, with clients ranging from small direct marketers to Travel Channel and Wells Fargo.

Online Marketing and Research Firms (PPC campaign management, etc.)

Starting Small—Find a Local Individual to Help

►**SEMPO (www.sempo.org;** see the member directory)

Excellent Mid-Size Firms

►**Clicks 2 Customers (www.clicks2customers.com**)

► Working Planet (www.workingplanet.com)

The Hard-Hitting Pros—Small Campaigns Start at Several Thousand Dollars

►**Marketing Experiments (www.marketingexperiments.com**) This is my team.

► **Did It (www.did-it.com)**

► **ROIRevolution (www.roirevolution.com)**

Cost is determined by a percentage above monthly PPC spend.

► **iProspect (www.iprospect.com)**

Full-Service Infomercial Producers

These are the companies that made Oreck Direct, Nutrisystem, Nordic-Track, and Hooked on Phonics household names. The first has an excellent DRTV glossary and both sites offer excellent resources. Don't call unless you can budget at least $15,000 for a short-form commercial or $50,000+ for a long-form infomercial.

► **Cesari Direct (http://www.cesaridirect.com /)**

► Hawthorne Direct (www.hawthornedirect.com)

► Script-to-Screen (www.scripttoscreen.com)

Retail and International Product Distribution

Want to get your product on the shelves of Wal-Mart, Costco, Nordstrom, or the leading department store in Japan? Sometimes it pays to have experts with relationships get you there.

► **Tristar Products (http://www.tristarproductsinc.com)**

Behind the PowerJuicer and other hits. Tristar also owns their own production studio and can therefore offer end-to-end services in addition to retail distribution.

► **BJ Direct (International) (www.bjgd.com)**

Celebrity Brokers

Want a celebrity to endorse your product or be a spokesperson? It can cost a lot less than you think, if you do it right. I know of one clothing endorsement deal with the best pitcher in Major League Baseball that cost just $20,000 per year. Here are the brokers who can make it happen:

► **Celeb Brokers (www.celebbrokers.com)**

President Jack King was the one who first turned me on to this fascinating world. He knows it all inside and out.

► **Celebrity Endorsement Network (www.celebrityendorsement.com)**

Celebrity Finding

► **Contact Any Celebrity (www.contactanycelebrity.com)**

It is possible to do it yourself, as I have done many times. This online directory and its helpful staff will help you find any celebrity in the world.

► LIFESTYLE DESIGN IN ACTION

After I read the section on outsourcing, I thought it sounded like a novel idea but would never work for me. However, since the rest of the book was "spot on," I decided to try it. Rather than ship my money overseas, I opted to keep it in the U.S. and use my niece in college, with skills on computers I can't even fathom, to test the theory. Turns out it has been a great experience and timesaver for me, as well as moneymaker for her. It seems I have all of the positives of out sourcing but none of the hassles of language and such…. Being able to mold a young mind for the better ties in well with the rest of your book …

—KEN D.

• • •

Hey Tim, You mentioned www.weebly.com a few months ago, and I've been using that to build all

I have found success in doing is: (1) Finding a niche group that would buy my muse, (2) sending a message to each admin telling them how my muse will help their group members. Then politely asking them to put a blurb in the "Recent News" section of the group. This makes it more trustworthy than a wall post, and it stays up there (free advertising) until the admin removes it. One hundred times better than a wall post. In one case, the admin purchased my muse, posted my note for me on the groups' "Recent News" section, then e-mailed the entire group telling them they have to check out my site.

—GAVIN

50. Richard Tedlow, *Giants of Enterprise: Seven Business Innovators and the Empires They Built* (2001; reprint, HarperBusiness, 2003).

51. This is adapted from "The Remote Control CEO," *Inc*. magazine, October 2005.

52. Actually, I'm the ghost in new machines now, as I sold BrainQUICKEN in 2009 to a private equity firm.

53. "Contract outsourcing companies" can be as simple as dependable web-based services. Don't let the term intimidate you.

54. Sample e-mail responses for fulfillment purposes can be found at www.fourhourblog.com.

55 Joseph Sugarman, *Advertising Secrets of the Written Word* (DelStar Books, 1998).

56 Depending on whose math is used (number of cars vs. gross sales), some claim the original Volkswagen Beetle holds the record.

57. For the benefit of the customer and to capitalize on universal laziness (me included), provide as much time as possible to consider or forget the product. Ginsu knives offered a 50-year guarantee. Can you offer a 60-, 90-, or even 365-day guarantee? Gauge average return percentages with a 30- or 60-day guarantee first (for budgeting calculations and cash-flow projections) and then extend it.

Step IV:

L is for Liberation

It is far better for a man to go wrong in freedom than to go right in chains .

—THOMAS H. HUXLEY,
English biologist; known as "Darwin's Bulldog"

Disappearing Act

► HOW TO ESCAPE THE OFFICE

> By working faithfully eight hours a day, you may eventually get to be a boss and work twelve hours a day.
>
> —ROBERT FROST, American poet and winner of four Pulitzer Prizes

> On this path, it is only the first step that counts.
>
> —ST. JEAN–BAPTISTE–MARIE VIANNEY, Catholic saint, "Curé d'Ars"

PALO ALTO , CALIFORNIA

"We're not going to expense the phone."

"I'm not asking you to."

Silence. Then a nod, a laugh, and a crooked smile of resignation.

"OK, then—it's fine."

And that was that, lickity-split. Forty-four-year old Dave Camarillo, lifelong employee, had cracked the code and started his second life.

He hadn't been fired; he hadn't been yelled at. His boss seemed to be handling the whole situation quite well. Granted, Dave delivered the goods on the job, and it wasn't like he was doing naked snow angels in client meetings, but still—he had just spent 30 days in China without telling anyone.

"It wasn't half as hard as I thought it would be."

Dave works among more than 10,000 employees at Hewlett- Packard (HP), and—against all odds—he actually likes it. He has no desire to start his own company and has spent the last seven years doing tech support for customers in 45 states and 22 countries. Six months ago, however, he had a small problem.

She measured 5′2″ and weighed 110 pounds.

Was he, like most men, afraid of commitment, unwilling to stop running around the house in Spider-Man underoos, or inseparable from the last refuge of any self-respecting man, the PlayStation? No, he was past all that. In fact, Dave was locked and loaded, ready to pop the big question, but he was short on vacation days and his girlfriend lived out of town. Waaaaay out of town—5,913 miles out of town.

He had met her on a client visit to Shenzhen, China, and it was now time to meet the parents, logistics be damned.

Dave had only recently begun to take tech calls at home, and, well, isn't home where the heart is? One plane ticket and one T-Mobile GSM tri-band phone later, he was somewhere over the Pacific en route to his first seven-day experiment. Twelve time zones hence, he proposed, she accepted, and no one was the wiser stateside.

The second field trip was a 30-day tour of Chinese family and food (pig face, anyone?), ending with Shumei Wu becoming Shumei Camarillo. Back in Palo Alto, HP continued its quest for world domination, neither knowing nor caring where Dave was. He had his calls forwarded to his newly begotten wife's cell phone and all was right in the world.

Now back in the U.S. after hoping for the best and preparing for the worst, Dave had earned his Eagle Scout mobility badge. The future looks flexible, indeed. He is going to start by spending two months in China every summer and then move to Australia and Europe to make up for lost time, all with the full support of his boss.

The key to cutting the leash was simple—he asked for forgiveness instead of permission.

"I didn't travel for 30 years of my life—so why not?"

* * *

THAT'S PRECISELY THE question everyone should be asking—why the hell not?

From Caste to Castaway

The old rich, the upper class of yore with castles and ascots and irritating little lapdogs, are characterized as being well-established in one place. The Schwarzes of Nantucket and the McDonnells of Charlottesville. Blech. Summers in the Hamptons is sooooo 1990s.

The guard is changing. Being bound to one place will be the new defining feature of middle class. The New Rich are defined by a more elusive power than simple cash—unrestricted mobility. This jet-setting is not limited to start-up owners or freelancers. Employees can pull it off, too.[58]

Not only can they pull it off, but more and more companies want them to pull it off. BestBuy, the consumer electronics giant, is now sending thousands of employees home from their HQ in Minnesota and claims not only lowered costs, but also a 10–20% increase in results. The new mantra is this: Work wherever and whenever you want, but get your work done.

In Japan, a three-piece zombie who joins the 9–5 grind each morning is called a *sarari-man* —salaryman—and, in the last few years, a new verb has emerged: *datsu-sara suru*, to escape (datsu) the salaryman (sara) lifestyle.

It's your turn to learn the datsu-sara dance.[59]

Trading Bosses for Beer: An Oktoberfest Case Study

To create the proper leverage to be unshackled, we'll do two things: demonstrate the business benefit of remote working and make it too expensive or excruciating to refuse a request for it.

Remember Sherwood?

His French shirts are beginning to move and he is itching to ditch the U.S. for a global walkabout. He has more than enough cash now but needs to escape constant supervision in the office before he can implement all the timesaving tools from **Elimination** and travel.

He is a mechanical engineer and is producing twice as many designs in half the time since erasing 90% of his time-wasters and interruptions. This quantum leap in performance has been noticed by his supervisors and his value to the company has increased, making it more expensive to lose him. More value means more leverage for negotiations. Sherwood has been sure to hold back some of his productivity and efficiency so that he can highlight a sudden jump in both during a remote work trial period.

Since eliminating most of his meetings and in-person discussions, he has naturally moved about 80% of all communication with his boss and colleagues to e-mail and the remaining 20% to phone. Not only this, but he has used tips from chapter 7, "Interrupting Interruption and the Art of Refusal," to cut unimportant and repetitive e-mail volume in half. This will make the move to remote less noticeable, if at all noticeable, from a managerial standpoint. Sherwood is running at full speed with less and less supervision.

Sherwood implements his escape in five steps, beginning on July 12 during the slow business season and lasting two months, ending with a trip to Oktoberfest in Munich, Germany, for two weeks as a final test before bigger and bolder vagabonding plans.

Step 1: Increase Investment

First, he speaks with his boss on **July 12** about additional training that might be available to employees. He proposes having the company pay for a four-week industrial design class to help him better interface with clients, being sure to mention the benefit to the boss and business (i.e., he'll decrease intradepartmental back-and-forth and increase both client results and billable time). Sherwood wants the company to invest as much as possible in him so that the loss is greater if he quits.

Step 2: Prove Increased Output Offsite

Second, he calls in sick the next Tuesday and Wednesday, **July 18 and 19**, to showcase his remote working productivity.[60] He decides to call in sick between Tuesday and Thursday for two reasons: It looks less like a lie for a three-day weekend and it also enables him to see how well he functions in social isolation without the imminent reprieve of the weekend. He ensures that he doubles his work output on both days, leaves an e-mail trail of some sort for his boss to notice, and keeps quantifiable records of what he accomplished for reference during later negotiations. Since he uses expensive CAD software that is only licensed on his office desktop, Sherwood installs a free trial of GoToMyPC remote access software so that he can pilot his office computer from home.

Step 3: Prepare the Quantifiable Business Benefit

Third, Sherwood creates a bullet-point list of how much more he achieved outside the office with explanations. He realizes that he needs to present remote working as a good business decision and not a personal perk. The quantifiable end result was three more designs per day than his usual average and three total hours of additional billable client time. For explanations, he identifies removal of commute and fewer distractions from office noise.

Step 4: Propose a Revocable Trial Period

Fourth, fresh off completing the comfort challenges from previous chapters, Sherwood confidently proposes an innocent one-day-per-week remote work trial period for two weeks. He plans a script in advance but does not make it a PowerPoint presentation or otherwise give it the appearance of something serious or irreversible.

Sherwood knocks on his boss's office door around 3 P.M. on a relatively relaxed Thursday, **July 27**, the week after his absence, and his script looks like the following. Stock phrases are underlined and footnotes explain negotiating points.

Sherwood: Hi, Bill. Do you have a quick second?

Bill: Sure. What's up?

Sherwood: I just wanted to bounce an idea off of you that's been on my mind. Two minutes should be plenty.

Bill: OK. Shoot.

Sherwood: Last week, as you know, I was sick. Long story short, I decided to work at home despite feeling terrible. So here's the funny part. I thought I would get nothing done, but ended up finishing three more designs than usual on both days. Plus, I put in three more billable hours than usual without the commute, office noise, distractions, etc. OK, so here's where I'm going. Just as a trial, I'd like to propose working from home Mondays and Tuesdays for just two weeks. You can veto it whenever you want, and I'll come in if we need to do meetings, but I'd like to try it for just two weeks and review the results. I'm 100% confident that I'll get twice as much done. Does that seem reasonable?

Bill: Hmm … What if we need to share client designs?

Sherwood: There's a program called GoToMyPC that I used to access the office computer when I was sick. I can view everything remotely, and I'll have my cell phone on me 24/7. Sooooo … What do you think? Test it out starting next Monday and see how much more I get done?[62]

Bill: Ummm … OK, fine. But it's just a test. I have a meeting in five and have to run, but let's talk soon.

Sherwood: Great. Thanks for the time. I'll keep you posted on it all. I'm sure you'll be pleasantly surprised.

Sherwood didn't expect to get two days per week approved. He asked for two so that, in the case his boss refused, he could ask for just one as a fallback position (bracketing). Why didn't Sherwood go for five days remote per week? Two reasons. First, it's a lot for management to accept off the bat. We need to ask for an inch and turn it into a foot without setting off panic alarms. Second, it is a good idea to hone your remote-working abilities—rehearse a bit—before shooting for the big time, as it decreases the likelihood of crises and screwups that will get remote rights revoked.

Step 5: Expand Remote Time

Sherwood ensures that his days outside of the office are his most productive to date, even minimally dropping in-office production to heighten the contrast. He sets a meeting to discuss the results with his boss on **August 15** and prepares a bullet-point page detailing increased results and items completed compared to in-office time. He suggests upping the ante to four days per week remote for a two-week trial, fully prepared to concede to three days if need be.

Sherwood: It really turned out even better than I expected. If you look at the numbers, it makes a lot of business sense, and I'm enjoying work a lot more now. So, here we are. I'd like to suggest, if you think it makes sense, that I try four days a week for another two-week trial. I was thinking that coming in Friday[63]would make sense to prepare for the coming week, but we could do whichever day you prefer.

Bill: Sherwood, I'm really not sure we can do that.

Sherwood: What's your main concern?[64]

Bill: It seems like you're on your way out. I mean, are you going to quit on us? Second, what if everyone wants to do the same?

Sherwood: Fair enough. Good points.[65] First, to be honest, I was close to quitting before, with all the interruptions and commute and whatnot, but I'm actually feeling great now with the change in routine.[66] I'm doing more and feel relaxed for a change. Second, no one should be allowed to work remotely unless they can show increased productivity, and I'm the perfect experiment. If they can show it, however, why not let them do it on a trial basis? It lowers costs for the office, increases productivity, and makes employees happier. So, what do you say? Can I test it out for two weeks and come in Fridays to take care of the office stuff? I'll still document everything, and you, of course, have the right to change your mind at any point.

Bill: Man, you are an insistent one. OK, we'll give it a shot, but don't go blabbing about it.

Sherwood: Of course. Thanks, Bill. I appreciate the trust. Talk to you soon.

Sherwood continues to be productive at home and maintains his lower in-office performance. He reviews the results with his boss after two weeks and continues with four remote days per week for an additional two weeks until Tuesday, **September 19**, when he requests a full-time remote trial of two weeks while he is visiting relatives out of state.[67] Sherwood's team is in the middle of a project that requires his expertise, and he is prepared to quit if his boss refuses. He realizes that, just as you want to negotiate ad pricing close to deadlines, getting what you want often depends more on *when* you ask for it than *how* you ask for it. Though he would prefer not to quit, his income from shirts is more than enough to fund his dream-lines of Oktoberfest and beyond.

His boss acquiesces and Sherwood doesn't have to use his threat of quitting. He goes home that evening and buys a $524 round-trip ticket, less than one week's shirt sales, to Munich for Oktoberfest.

Now he can implement all the time-savers possible and hack out the inessentials. Somewhere between drinking wheat beer and dancing in lederhosen, Sherwood will get his work done in fine form, leaving his company better off than prior to 80/20 and leaving himself all the time in the world.

But hold on a second … What if your boss still refuses? Hmm … Then they force your hand. If upper management won't see the light, you'll just have to use the next chapter to fire their asses.

An Alternative: The Hourglass Approach

It can be effective to take a longer period of absence up front in what some **NR** have termed the "hourglass" approach, so named because you use a long proof-of-concept up front to get a short remote agreement and then negotiate back up to full-time out of the office. Here's what it looks like.

1. Use a preplanned project or emergency (family issue, personal issue, relocation, home repairs, whatever) that requires you to take one or two weeks out of the office.
2. Say that you recognize you can't just stop working and that you would prefer to work instead of taking vacation days.
3. Propose how you can work remotely and offer, if necessary, to take a pay cut for that period (and that period only) if performance isn't up to par upon returning.
4. Allow the boss to collaborate on how to do it so that he or she is invested in the process.

5. Make the two weeks "off" the most productive period you've ever had at work.
6. Show your boss the quantifiable results upon returning, and tell him or her that—without all the distractions, commute, etc.—you can get twice as much done. Suggest two or three days at home per week as a trial for two weeks.
7. Make those remote days ultraproductive.
8. Suggest only one or two days in the office per week.
9. Make those days the least productive of the week.
10. Suggest complete mobility—the boss will go for it.

► Q&A: QUESTIONS AND ACTIONS

> Recently, I was asked if I was going to fire an employee who made a mistake that cost the company $600,000. No, I replied, I just spent $600,000 training him.
>
> —THOMAS J. WATSON, founder of IBM

> Liberty means responsibility. That is why most men dread it.
>
> —GEORGE BERNARD SHAW

While entrepreneurs have the most trouble with **Automation**, since they fear giving up control, employees get stuck on **Liberation** because they fear taking control. Resolve to grab the reins—the rest of your life depends on it.

The following questions and actions will help you to replace presence-based work with performance-based freedom.

1. **If you had a heart attack, and assuming your boss were sympathetic, how could you work remotely for four weeks?**

   If you hit a brick wall with a task that doesn't seem remote-compatible or if you predict resistance from your boss, ask the following:

   - What are you accomplishing with this task—what is the purpose?
   - If you *had to* find other ways to accomplish the same—if your life depended on it—how would you do it? Remote conferencing? Video conferencing? GoToMeeting, GoToMyPC, DimDim.com (Mac), or related services?
   - Why would your boss resist remote work? What is the

immediate negative effect it would have on the company and what could you do to prevent or minimize it?

2. **Put yourself in your boss's shoes. Based on your work history, would you trust yourself to work outside of the office?**

   If you wouldn't, reread **Elimination** to improve production and consider the hourglass option.

3. **Practice environment-free productivity**.

   Attempt to work for two to three hours in a café for two Saturdays prior to proposing a remote trial. If you exercise in a gym, attempt to exercise for those two weeks at home or otherwise outside of the gym environment. The purpose here is to separate your activities from a single environment and ensure that you have the discipline to work solo.

4. **Quantify current productivity**.

   If you have applied the 80/20 Principle, set the rules of interrupting interruption, and completed related groundwork, your performance should be at an all-time high in quantifiable terms, whether customers served, revenue generated, pages produced, speed of accounts receivable, or otherwise. Document this.

5. **Create an opportunity to demonstrate remote work productivity before asking for it as a policy**.

   This is to test your ability to work outside of an office environment and rack up some proof that you can kick ass without constant supervision.

6. **Practice the art of getting past "no" before proposing**.

   Go to farmers' markets to negotiate prices, ask for free first-class upgrades, ask for compensation if you encounter poor service in restaurants, and otherwise ask for the world and practice using the following magic questions when people refuse to give it to you.

   "What would I need to do to [desired outcome]?"
   "Under what circumstances would you [desired outcome]?"
   "Have you ever made an exception?"
   "I'm sure you've made an exception before, haven't you?"
   (If no for either of the last two, ask, "Why not?" If yes, ask, "Why?")

7. **Put your employer on remote training wheels—propose Monday or Friday at home**.

   Consider doing this, or the following step, during a period when it would be too disruptive to fire you, even if you were marginally less productive while remote.

   If your employer refuses, it's time to get a new boss or become an entrepreneur. The job will never give you the requisite time freedom. If you decide to jump ship, consider letting them make you walk the plank—quitting is often less appealing than tactfully getting fired and using severance or unemployment to take a long vacation.

8. **Extend each successful trial period until you reach full-time or your desired level of mobility**.

   Don't underestimate how much your company needs you. Perform well and ask for what you want. If you don't get it over time, leave. It's too big a world to spend most of life in a cubicle.

► LIFESTYLE DESIGN IN ACTION

Consider trying Earth Class Mail, a service that you can reroute all your mail to, at which point they scan and e-mail you everything that comes in, giving you the option of recycling/shredding junk, getting a scan of the contents, or having specific items forwarded to you or someone you designate. I have not personally used it yet (will be testing it out this month in preparation for an upcoming trip in May), but a friend and author in Portland swears by them and knows the CEO. Seems they've gotten good press and the idea seems far better than relying on friends/family who, if they're anything like my friends/family … will surely drop the ball at some point:-).

—NATHALIE

• • •

I also use GreenByPhone.com to process checks electronically that come in through my Earth Class Mail account—they charge $5 a check, but I live in San Diego, my Earth Class Mail office address is in Seattle, and I bank in Ohio. It works great!

—ANDREW

• • •

To add to your excellent list (we've traveled just like that for several years SWEET!), I'd like to add my modifications as a female traveler and a new mom (16-month-old baby). Personal favorites: (1) Athleta carries excellent, light, quick-dry clothing that hold up well to sports but still look very fashionable. Skorts are a must for looking feminine but being fully covered for hiking and steep pyramid steps—you know what I mean, ladies! Just a note, a slightly longer length will serve you well in a lot of countries, as well as tankini tops and swim skirts for swimming. (2) Fresh & Go toothbrush is simple to use. (3) Marsona sound machine for drowning out unfamiliar noises is a must (regularly use with baby at home too so when they hear the sound they know it's sleep time!). This has been a lifesaver for us on many trips, and we now use it regularly at home for better sleep. No more changing hotels midtrip to avoid noise. AND, I know we have to travel light, but with baby a lot of things are nonnegotiable. These make for smoother sailing: (1) Peanut shell sling in black fleece—it's more comfy than the cotton and you can pop baby in and out wherever you are, from birth to 35 lbs. I never take mine off, it's part of my outfit; (2) Peapod plus portable tent—this is baby's main bed at home and travel so baby has the same sleep place everywhere we go, and the flaps give all travel parties privacy—great from small babies to five-year-olds. I can still jam this onto a little wheeled carry-on and pack mine and baby's minimal clothing around it; (3) Go Go Kidz TravelMate (great for wheeling car seat up to the gate for gate check or use on plane); (4) Britax Diplomat car seat is small but kids can use it from birth to approx. four years old.

Make sure the wheeled carry-on bag you get is one size smaller than the allowed carry-on size so you don't get bumped to check the bag in if the plane is full. You can always nicely argue/reason/bat your eyelashes that you will put the bag in your foot space. Also, very helpful to give baby something to sip or munch on during take off and landing so yours isn't the baby screaming from ear pain. Happy travels!

—KARYL

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PRE-EMPTING THE BOSS: COMMON CONCERNS ABOUT REMOTE WORK

In the linked article, Cisco acknowledges that remote work arrangements are "here to stay" yet lists a set of security issues. It makes sense to preemptively research solutions so that you are armed and ready if your employer raises these concerns. http://newsroom.cisco.com/dlls/2008/prod_020508.html.

—Contributed by RAINA

58. If you're an entrepreneur, don't skip this chapter. This introduction to remote working tools and tactics is integral to the international pieces of the puzzle that follow.

59. This verb is used by Japanese women as well, even though female workers are referred to as "OL"—office ladies.

60. Any reason to be home will do (cable or phone installation, home repairs, etc.) or, if you prefer not to use a ruse, work a weekend or take two vacation days.

61. Review the Puppy Dog Close from "Income Autopilot II: Testing the Muse."

62. Do not digress from your goal. Once you've addressed an objection or concern, go for the close.

63. Friday is the best day to be in the office. People are relaxed and tend to leave early.

64. Do not accept a vague refusal. Pinpointing the main concern in detail enables you to overcome it.

65. Don't jump to the defensive after an objection. Acknowledge the validity of a boss's concerns to prevent an ego-driven battle of wills.

66. Note this indirect threat dressed as a confession. It will make the boss think twice about refusing but prevents the win-lose outcome of an ultimatum.

67. This removes the boss's ability to call you to the office. This is critical for making the first jump overseas.

⓭

Beyond Repair

► KILLING YOUR JOB

> All courses of action are risky, so prudence is not in avoiding danger (it's impossible), but calculating risk and acting decisively. Make mistakes of ambition and not mistakes of sloth. Develop the strength to do bold things, not the strength to suffer.
>
> —NICCOLÒ MACHIAVELLI, *The Prince*

Existential Pleas and Resignations Mad Libs

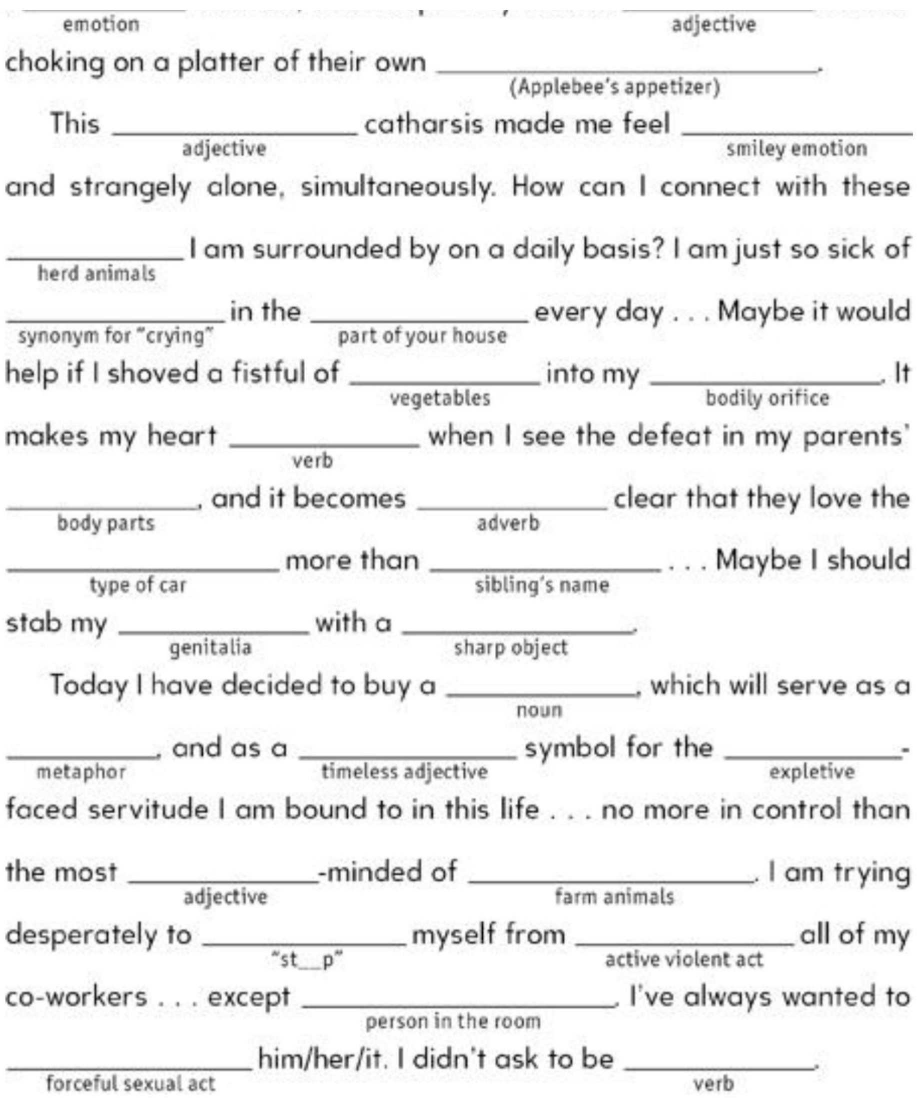
BY ED MURRAY

Dear ____________________ preferred deity of choice,

I realized something very ____________ adjective today as I was washing my ____________ animal, and that something is this: You are a/an ____________ adverb cruel ____________________ personal expletive pronoun.

Last night, after drinking seven shots of ____________________ least favorite hard liquor and snorting enough ______________ drug to make ____________________ politician blush, it became clear: It really is them, and not me.

I am the one who is completely ________________________ helpless state of being when it comes to the ______________ favorite color personal relationships in my life, and yet, I share my innermost ____________ type of candy with no one else on this ____________ adjective planet . . . because they are all ________________ insulting adjective ________________ extinct animals.


emotion adjective

choking on a platter of their own ________________________.
(Applebee's appetizer)

This ________________ catharsis made me feel ________________
adjective smiley emotion

and strangely alone, simultaneously. How can I connect with these

____________ I am surrounded by on a daily basis? I am just so sick of
herd animals

______________ in the ______________ every day . . . Maybe it would
synonym for "crying" part of your house

help if I shoved a fistful of ____________ into my ______________. It
vegetables bodily orifice

makes my heart ____________ when I see the defeat in my parents'
verb

____________, and it becomes ____________ clear that they love the
body parts adverb

________________ more than ______________ . . . Maybe I should
type of car sibling's name

stab my ____________ with a ______________.
genitalia sharp object

Today I have decided to buy a ____________, which will serve as a
noun

__________, and as a ______________ symbol for the ____________-
metaphor timeless adjective expletive

faced servitude I am bound to in this life . . . no more in control than

the most ____________-minded of ________________. I am trying
adjective farm animals

desperately to ____________ myself from ______________ all of my
"st__p" active violent act

co-workers . . . except ____________________, I've always wanted to
person in the room

________________ him/her/it. I didn't ask to be ____________.
forceful sexual act verb

Some jobs are simply beyond repair.

Improvements would be like adding a set of designer curtains to a jail cell: better but far from good. In the context of this chapter, "job" will refer to both a company if you run one and a normal job if you have one. Some recommendations are limited to one of the two but most are relevant to both. So we begin.

I have quit three jobs and been fired from most of the rest. Getting fired, despite sometimes coming as a surprise and leaving you scrambling to recover, is often a godsend: Someone else makes the decision for you, and it's impossible to sit in the wrong job for the rest of your life. Most people aren't lucky enough to get fired and die a slow spiritual death over 30–40 years of tolerating the mediocre.

Pride and Punishment

> If you must play, decide on three things at the start: the rules of the game, the stakes, and the quitting time.

CHINESE PROVERB

Just because something has been a lot of work or consumed a lot of time doesn't make it productive or worthwhile.

Just because you are embarrassed to admit that you're still living the consequences of bad decisions made 5, 10, or 20 years ago shouldn't stop you from making good decisions now. If you let pride stop you, you will hate life 5, 10, and 20 years from now for the same reasons. I hate to be wrong and sat in a dead-end trajectory with my own company until I was forced to change directions or face total breakdown—I know how hard it is.

Now that we're all on a level playing field: Pride is stupid.

Being able to quit things that don't work is integral to being a winner. Going into a project or job without defining when worthwhile becomes wasteful is like going into a casino without a cap on what you will gamble: dangerous and foolish.

"But, you don't understand my situation. It's complicated!" But is it really? Don't confuse the complex with the difficult. Most situations are simple—many are just emotionally difficult to act upon. The problem and the solution are usually obvious and simple. It's not that you don't know what to do. Of course you do. You are just terrified that you might end up worse off than you are now.

I'll tell you right now: If you're at this point, you won't be worse off. Revisit fear-setting and cut the cord.

Like Pulling Off a Band-Aid: It's Easier and Less Painful Than You Think

> The average man is a conformist, accepting miseries and disasters with the stoicism of a cow standing in the rain.
>
> —COLIN WILSON, British author of *The Outsider;* New Existentialist

There are several principal phobias that keep people on sinking ships, and there are simple rebuttals for all of them.

1. Quitting is permanent.

Far from it. Use the Q&A questions in this chapter and chapter 3 (Fear-setting) to examine how you could pick up your chosen career track or start another company at a later point. I have never seen an example where a change of direction wasn't somehow reversible.

2. I won't be able to pay the bills.

Sure you will. First of all, the objective will be to have a new job or source of cash flow before quitting your current job. Problem solved.

If you jump ship or get fired, it isn't hard to eliminate most expenses temporarily and live on savings for a brief period. From renting out your home to refinancing or selling it, there are options. There are always options.

It might be emotionally difficult, but you won't starve. Park your car in the garage and cancel insurance for a few months. Carpool or take the bus until you find the next gig. Rack up some more credit card debt and cook instead of eating out. Sell all the crap that you spent hundreds or thousands on and never use.

Take a full inventory of your assets, cash reserves, debts, and monthly expenses. How long could you survive with your current resources or if you sold some assets?

Go through all expenses and ask yourself, If I *had to* eliminate this because I needed an extra kidney, how would I do it? Don't be melodramatic when there is no need—few things are fatal, particularly for smart people. If you've made it this far in life, losing or dropping a job will often be little more than a few weeks of vacation (unless you want more) prior to something better.

3. Health insurance and retirement accounts disappear if I quit.

Untrue.

I was scared of both when I was eliminated from TrueSAN. I had visions of rotting teeth and working at Wal-Mart to survive.

Upon looking at the facts and exploring options, I realized that I could have identical medical and dental coverage—the same provider and network—for $300–500 per month. To transfer my 401(k) to another company (I chose Fidelity Investments) was even easier: It took less than 30 minutes via phone and cost nothing.

Covering both of these bases takes less time than getting a customer service rep on the phone to fix your electric bill.

4. It will ruin my resume.

I love creative nonfiction.

It is not at all difficult to sweep gaps under the rug and make uncommon items the very things that get job interviews. How? Do something interesting and make them jealous. If you quit and then sit on your ass, I wouldn't hire you either.

On the other hand, if you have a one-to-two-year world circumnavigation on your resume or training with professional soccer teams in Europe to your credit, two interesting things happen upon returning to the working world. First, you will get more interviews because you will stand out. Second, interviewers bored in their own jobs will spend the entire meeting asking how you did it!

If there is any question of why you took a break or left your previous job, there is one answer that cannot be countered: "I had a once-in-a-lifetime chance to do [exotic and envy-producing experience] and couldn't turn it down. I figured that, with [20–40] years of work to go, what's the rush?"

The Cheesecake Factor

Would you like me to give you a formula for success? It's quite simple, really. Double your rate of failure.

—THOMAS J. WATSON, founder of IBM

SUMMER 1999

Even before I tasted it, I knew something wasn't quite right. After eight hours in the refrigerator, this cheesecake still hadn't set at all. It swished in the gallon bowl like a viscous soup, chunks shifting and bobbing as I tilted it under close inspection. Somewhere a mistake had been made. It could have been any number of things:

Three 1 lb. sticks of Philly Cream Cheese
Eggs
Stevia
Unflavored gelatin
Vanilla
Sour cream

In this case, it was probably a combination of things and the lack of a few simple ingredients that generally make cheesecake a form of cake.

I was on a no-carbohydrate diet, and I had used this recipe before. It had been so delicious that my roommates wanted their fair share and insisted on an attempt at bulk production. Hence began the mathematical shenanigans and problems.

Before Splenda® and other miracles of sugar imitation came on the scene, the hard core used stevia, an herb 300 times sweeter than sugar. One drop was like 300 packets of sugar. It was a delicate tool and I wasn't a delicate cook. I had once made a small handful of cookies using baking soda instead of baking powder, and that was bad enough to drive my roommates to puke on the lawn. This new masterpiece made the cookies look like fine dining: It tasted like liquid cream cheese mixed with cold water and about 600 packets of sugar.

I then did what any normal and rational person would do: I grabbed the largest soup ladle with a sigh and sat down in front of the TV to face my punishment. I had wasted an entire Sunday and a boatload of ingredients—it was time to reap what I had sown.

One hour and 20 large spoonfuls later, I hadn't made a dent in the enormous batch of soup, but I was down for the count. Not only could I not eat anything but soup for two days, I couldn't bring myself to even look at cheesecake, previously my favorite dessert, for more than four years.

Stupid? Of course. It's about as stupid as one can get. This is a ridiculous and micro example of what people do on a larger scale with jobs all the time: self-imposed suffering that can be avoided. Sure, I learned a lesson and paid for the mistake. The real question is—for what?

There are two types of mistakes: mistakes of ambition and mistakes of sloth.

The first is the result of a decision to act—to do something. This type of mistake is made with incomplete information, as it's impossible to have all the facts beforehand. This is to be encouraged. Fortune favors the bold.

The second is the result of a decision of sloth—to not do something—wherein we refuse to change a bad situation out of fear despite having all the facts. This is how learning experiences become terminal punishments, bad relationships become bad marriages, and poor job choices become lifelong prison sentences.

"Yeah, but what if I'm in an industry where jumping around is looked down upon? I've been here barely a year, and prospective employers would think..."

Would they? Test assumptions before condemning yourself to more misery. I've seen one determinant of sex appeal to good employers: performance. If you are a rock star when it comes to results, it doesn't matter if you jump ship from a bad company after three weeks. On the other hand, if tolerating a punishing work environment for years at a time is a prerequisite for promotion in your field, could it be that you're in a game not worth winning?

The consequences of bad decisions do not get better with age.

What cheesecake are you eating?

Q&A: QUESTIONS AND ACTIONS

> Only those who are asleep make no mistakes.
>
> —INGVAR KAMPRAD, founder of IKEA, world's largest furniture brand

Tens of thousands of people, most of them less capable than you, leave their jobs every day. It's neither uncommon nor fatal. Here are a few exercises to help you realize just how natural job changes are and how simple the transition can be.

1. First, a familiar reality check: Are you more likely to find what you want in your current job or somewhere else?
2. If you were fired from your job today, what would you do to get things under financial control?
3. Take a sick day and post your resume on the major job sites. Even if you have no immediate plans to leave your job, post your resume on sites such as www.monster.com and www.careerbuilder.com, using a pseudonym if you prefer. This will show you that there are options besides your current place of work. Call headhunters if your level makes such a step appropriate, and send a brief e-mail such as the one below to friends and non-work contacts.

   Dear All,

   I am considering making a career move and am interested in all opportunities that might come to mind. Nothing is too outrageous or out of left field. [If you know what you want or don't want on some level, feel free to add, "I am particularly interested in …" or "I would like to avoid …"]

   Please let me know if anything comes to mind!

   Tim

   Call in sick or take a vacation day to complete all of these exercises during a normal 9–5 workday. This will simulate unemployment and lessen the fear factor of non-office limbo.

   In the world of action and negotiation, there is one principle that governs all others: The person who has more options has more power. Don't wait until you need options to search for them. Take a sneak peek at the future now and it will make both action and being assertive easier.
4. If you run or own a company, imagine that you have just been sued and must declare bankruptcy. The company is now insolvent and you must close up shop. This is something you *must* legally do, and there are no finances to entertain other options. How would you survive?

TOOLS AND TRICKS

Considering Options and Pulling the Trigger

► **I-Resign (www.i-resign.com)**

This site provides everything from non-quitting options (work-leave, vacations) to sample resignation letters and second-life job-hunting advice. Don't miss the helpful discussion forums and hysterical "web consultant from London" letter.

Opening Retirement Accounts

If you want an adviser and don't mind some fees:

► **Franklin-Templeton (www.franklintempleton.com) (800–527–2020)**

► **American Funds (www.americanfunds.com) (800–421–0180)**

If you will do your own investing and want no-load funds:

► **Fidelity Investments (www.fidelity.com) (800–343–3548)**

► **Vanguard (www.vanguard.com) (800–414–1321)**

Health Insurance for Self-employed or Unemployed (in descending order of reader endorsement)

► **Ehealthinsurance (www.ehealthinsurance.com) (800–977–8860)**

► **AETNA (www.aetna.com) (800-MY-HEALTH)**

► **Kaiser Permanente (www.kaiserpermanente.com) (866–352–0290)**

► **American Community Mutual (www.american-community.com) (800–991–2642)**

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Mini-Retirements

► EMBRACING THE MOBILE LIFESTYLE

Before the development of tourism, travel was conceived to be like study, and its fruits were considered to be the adornment of the mind and the formation of the judgment.

—PAUL FUSSELL, *Abroad*

The simple willingness to improvise is more vital, in the long run, than research.

—ROLF POTTS, *Vagabonding*

Upon Sherwood's return from Oktoberfest, dazed from killing neurons but the happiest he's been in four years, the remote trial is made policy and Sherwood is inducted into the world of the New Rich. All he needs now is an idea of how to exploit this freedom and the tools to give his finite cash near-infinite lifestyle output.

If you've gone through the previous steps, eliminating, automating, and severing the leashes that bind you to one location, it's time to indulge in some fantasies and explore the world.

Even if you have no ache for extended travel or think it's impossible—whether due to marriage or mortgage or those little things known as children—this chapter is still the next step. There are fundamental changes I and most others put off until absence (or preparation for it) forces them. This chapter is your final exam in muse design.

The transformation begins in a small Mexican village, in a parable that's been shared in various forms around the world.

Fables and Fortune Hunters

An American businessman took a vacation to a small coastal Mexican village on doctor's orders. Unable to sleep after an urgent phone call from the office the first morning, he walked out to the pier to clear his head. A small boat with just one fisherman had docked, and inside the boat were several large yellowfin tuna. The American complimented the Mexican on the quality of his fish.

"How long did it take you to catch them?" the American asked.

"Only a little while," the Mexican replied in surprisingly good English.

"Why don't you stay out longer and catch more fish?" the American then asked.

"I have enough to support my family and give a few to friends," the Mexican said as he unloaded them into a basket.

"But … What do you do with the rest of your time?"

The Mexican looked up and smiled. "I sleep late, fish a little, play with my children, take a siesta with my wife, Julia, and stroll into the village each evening, where I sip wine and play guitar with my amigos. I have a full and busy life, señor."

The American laughed and stood tall. "Sir, I'm a Harvard M.B.A. and can help you. You should spend more time fishing, and with the proceeds, buy a bigger boat. In no time, you could buy several boats with the increased haul. Eventually, you would have a fleet of fishing boats."

He continued, "Instead of selling your catch to a middleman, you would sell directly to the consumers, eventually opening your own cannery. You would control the product, processing, and distribution. You would need to leave this small coastal fishing village, of course, and move to Mexico City, then to Los Angeles, and eventually New York City, where you could run your expanding enterprise with proper management."

The Mexican fisherman asked, "But, señor, how long will all this take?"

To which the American replied, "15–20 years. 25 tops."

"But what then, señor?"

The American laughed and said, "That's the best part. When the time is right, you would announce an IPO and sell your company stock to the public and become very rich. You would make millions."

"Millions, señor? Then what?"

"Then you would retire and move to a small coastal fishing village, where you would sleep late, fish a little, play with your kids, take a siesta with your wife, and stroll to the village in the evenings where you could sip wine and play your guitar with your amigos …"

I RECENTLY HAD lunch in San Francisco with a good friend and former college roommate. He will soon graduate from a top business school and return to investment banking. He hates coming home from the office at midnight but explained to me that, if he works 80-hour weeks for nine years, he could become a managing director and make a cool $3–10 million per year. Then he would be successful.

"Dude, what on earth would you do with $3–10 million per year?" I asked.

His answer? "I would take a long trip to Thailand."

That just about sums up one of the biggest self-deceptions of our modern age: extended world travel as the domain of the ultrarich. I've also heard the following:

"I'll just work in the firm for 15 years. Then I'll be partner and I can cut back on hours. Once I have a million or two in the bank, I'll put it in something safe like bonds, take $80,000 a year in interest, and retire to sail in the Caribbean."

"I'll only work in consulting until I'm 35, then retire and ride a motorcycle across China."

If your dream, the pot of gold at the end of the career rainbow, is to live large in Thailand, sail around the Caribbean, or ride a motorcycle across China, guess what? All of them can be done for less than $3,000. I've done all three. Here are just two examples of how far a little can go.[68]

$250 U.S. Five days on a private Smithsonian tropical research island with three local fishermen who caught and cooked all my food and also took me on tours of the best hidden dive spots in Panamá.

$150 U.S. Three days of chartering a private plane in Mendoza wine country in Argentina and flying over the most beautiful vineyards around the snowcapped Andes with a personal guide.

Question: What did you spend your last $400 on? It's two or three weekends of nonsense and throwaway forget-the-workweek behavior in most U.S. cities. $400 is nothing for a full eight days of life-changing experiences. But eight days isn't what I'm recommending at all. Those were just interludes in a much larger production. I'm proposing much, much more.

The Birth of Mini-Retirements and the Death of Vacations

> There is more to life than increasing its speed.
>
> —MOHANDAS GANDHI

In February of 2004, I was miserable and overworked.

My travel fantasy began as a plan to visit Costa Rica in March 2004 for four weeks of Spanish and relaxation. I needed a recharge and four weeks seemed “reasonable” by whatever made-up benchmark you can use for such a thing.

A friend familiar with Central America dutifully pointed out that it would never work, as Costa Rica was about to enter its rainy season. Torrential downpours weren’t the uplifting jolt I needed, so I shifted my focus to four weeks in Spain. It’s a long trip over the Atlantic, though, and Spain was close to other countries I’d always wanted to visit. I lost “reasonable” somewhere shortly thereafter and decided that I deserved a full three months to explore my roots in Scandinavia after four weeks in Spain.

If there were any real-time bombs or pending disasters, they would certainly crop up in the first four weeks, so *there really wasn’t any additional risk in extending my trip to three months*. Three months would be great.

Those three months turned into 15, and I started to ask myself, “Why not take the usual 20–30-year retirement and redistribute it throughout life instead of saving it all for the end?”

The Alternative to Binge Traveling

> Thanks to the Interstate Highway System, it is now possible to travel from coast to coast without seeing anything.
>
> —CHARLES KURALT, CBS news reporter

If you are accustomed to working 50 weeks per year, the tendency, even after creating the mobility to take extended trips, will be to go nuts and see 10 countries in 14 days and end up a wreck. It’s like taking a starving dog to an all-you-can-eat buffet. It will eat itself to death.

I did this three months into my 15-month vision quest, visiting seven countries and going through at least 20 check-ins and checkouts with a friend who had negotiated three weeks off. The trip was an adrenaline-packed blast but like watching life on fast-forward. It was hard for us to remember what had happened in which countries (except Amsterdam),[69] we were both sick most of the time, and we were upset to have to leave some places simply because our pre-purchased flights made it so.

I recommend doing the exact opposite.

The alternative to binge travel—the mini-retirement—entails relocating to one place for one to six months before going home or moving to another locale. It is the anti-vacation in the most positive sense. Though it can be relaxing, the mini-retirement is not an escape from your life but a reexamination of it—the creation of a blank slate. Following elimination and automation, what would you be escaping from? Rather than seeking to *see* the world through photo ops between foreign-but-familiar hotels, we aim to *experience* it at a speed that lets it change us.

This is also different from a sabbatical. Sabbaticals are often viewed much like retirement: as a one-time event. Savor it now while you can. The mini-retirement is defined as recurring—it is a *lifestyle*. I currently take three or four mini-retirements per year and know dozens who do the same. Sometimes these sojourns take me around the world; oftentimes they take me around the corner—Yosemite, Tahoe, Carmel—but to a different world psychologically, where meetings, e-mail, and phone calls don't exist for a set period of time.

Purging the Demons: Emotional Freedom

> This is the very perfection of a man, to find out his own im perfection.
>
> —SAINT AUGUSTINE (354 A.D.–430 A.D.)

True freedom is much more than having enough income and time to do what you want. It is quite possible—actually the rule rather than the exception—to have financial and time freedom but still be caught in the throes of the rat race. One cannot be free from the stresses of a speed- and size-obsessed culture until you are free from the materialistic addictions, time-famine mind-set, and comparative impulses that created it in the first place.

This takes time. The effect is not cumulative, and no number of two-week (also called "too weak")[70] sightseeing trips can replace one good walkabout.[71]

In the experience of those I've interviewed, it takes two to three months just to unplug from obsolete routines and become aware of just how much we distract ourselves with constant motion. Can you have a two-hour dinner with Spanish friends without getting anxious? Can you get accustomed to a small town where all businesses take a siesta for two hours in the afternoon and then close at 4:00 P.M.? If not, you need to ask, Why?

Learn to slow down. Get lost intentionally. Observe how you judge both yourself and those around you. Chances are that it's been a while. Take at least two months to disincorporate old habits and rediscover yourself without the reminder of a looming return flight.

The Financial Realities: It Just Gets Better

The economic argument for mini-retirements is the icing on the cake. Four days in a decent hotel or a week for two at a nice hostel costs the same as a month in a nice posh apartment. If you relocate, the expenses abroad also begin to replace—often at much lower cost—bills you can then cancel stateside.

Here are some actual monthly figures from recent travels.

Highlights from both South America and Europe are shown side by side to prove that luxury is limited by your creativity and familiarity with the locale, not gross currency devaluation in third-world countries. It will be obvious that I did not survive on bread and begging—I lived like a rock star—and both experiences could be done for less than 50% of what I spent. My goal was enjoyment and not austere survival.

Airfare

- ► Free, courtesy of AMEX gold card and Chase Continental Airlines Mastercard[72]

Housing

- ► Penthouse apartment on the equivalent of New York’s Fifth Avenue in Buenos Aires, including house cleaners, personal security guards, phone, energy, and high-speed Internet: $550 U.S. per month

- ► Enormous apartment in the trendy SoHo-like Prenzlauerberg district of Berlin, including phone and energy: $300 U.S. per month

Meals

- ► Four- or five-star restaurant meals twice daily in Buenos Aires: $10 U.S. ($300 U.S. per month)

- ► Berlin: $18 U.S. ($540 U.S. per month)

Entertainment

- ► VIP table and unlimited champagne for eight people at the hottest club, Opera Bay, in Buenos Aires: $150 U.S. ($18.75 U.S. per person **x** four visits per month = $75 U.S. per month per person)

- ► Cover, drinks, and dancing at the hottest clubs in West Berlin: $20 U.S. per person per night **x** 4 = $80 U.S. per month

Education

- ► Two hours daily of private Spanish lessons in Buenos Aires, fives times per week: $5 U.S. per hour **x** 40 hours per month = $200 U.S. per month

- ► Two hours daily of private tango lessons with two world-class professional dancers: $8.33 U.S. per hour **x** 40 hours per month = $333.20 U.S. per month

- ► Four hours daily of top-tier German-language instruction in Nollendorfplatz, Berlin: $175 U.S. per month, which would have paid for itself even if I had not attended classes, as the student ID card entitled me to over 40% discounts on all transportation

- ► Six hours per week of mixed martial arts (MMA) training at the top Berlin academy: free in exchange for tutoring in English two hours per week

Transportation

- ► Monthly subway pass and daily cab rides to and from tango lessons in Buenos Aires: $75 U.S. per month

- ► Monthly subway, tram, and bus pass in Berlin with student discount: $85 U.S. per month

Four-Week Total for Luxury Living

- ► **Buenos Aires: $1533.20** , including round-trip airfare from JFK, with a one-month stopover in Panamá. Nearly one-third of this total is from the daily one-on-one instruction from world-class teachers in Spanish and Tango.

- ► **Berlin: $1180** , including round-trip airfare from JFK and a one-week stopover in London.

How do these numbers compare to your current domestic monthly expenses, including rent, car insurance, utilities, weekend expenditures, partying, public transportation, gas, memberships, subscriptions, food, and all the rest? Add it all up and you may well realize, like I did, that traveling around the world and having the time of your life can save you serious money.

Fear Factors: Overcoming Excuses Not to Travel

> Travelling is the ruin of all happiness! There’s no looking at a building here after seeing Italy.
> —FANNY BURNEY (1752–1840), English novelist

> But I have a house and kids. I can’t travel!
> What about health insurance? What if something happens?
> Isn’t travel dangerous? What if I get kidnapped or mugged?
> But I’m a woman—traveling alone would be dangerous.

Most excuses not to travel are exactly that—excuses. I’ve been there, so this isn’t a holier-than-thou sermon. I know too well that it’s easier to live with ourselves if we cite an external reason for inaction.

I’ve since met paraplegics and the deaf, senior citizens and single mothers, home owners and the poor, all of whom have sought and found excellent life-changing reasons for extended travel instead of dwelling on the million small reasons *against it.*

Most of the concerns above are addressed in the Q&A, but one in particular requires a bit of preemptive nerve calming.

It’s 10:00 P.M. Do You Know Where Your Children Are?

The prime fear of all parents prior to their first international trip is somehow losing a child in the shuffle.

The good news is that if you are comfortable taking your kids to New York, San Francisco, Washington, D.C., or London, you will have even less to worry about in the starting cities I recommend in the Q&A. There are fewer guns and violent crimes in all of them compared to most large U.S. cities. The likelihood of problems is decreased further when travel is less airport and hotel-hopping among strangers and more relocation to a second home: a mini-retirement.

But still, what if?

Jen Errico, a single mother who took her two children on a five-month world tour, had a more acute fear than most, one that often woke her at 2:00 A.M. in a cold sweat: What if something happens to me?

She wanted to prime her kids for worst-case scenario but didn’t want to scare them to death, so—like all good mothers—she made it a game: Who can best memorize the itineraries, hotel addresses, and Mom’s phone number? She had emergency contacts in each country whose numbers were loaded into the speed dial of her cell phone, which had global roaming. In the end, nothing happened. Now she’s planning to move to a ski chalet in Europe and send her kids to school in multilingual France. Success begets success.

She was most afraid in Singapore, and in retrospect, it was where she had the least reason to be worried (she took her kids to South Africa, among other places). She was scared because it was the first stop and she was unaccustomed to traveling with her kids. It was perception, not reality.

Robin Malinsky-Rummell, who spent a year traveling through South America with her husband and seven-year-old son, was warned by friends and family not to visit Argentina after their devaluation riots in 2001. She did her homework, decided that the fear was unfounded, and proceeded to have the time of her life in Patagonia. When she told locals that she was originally from New York, their eyes widened and jaws dropped: “I saw those buildings blow up on TV! I would never go to such a dangerous place!” Don’t assume that places abroad are more dangerous than your hometown. Most aren’t.

Robin is convinced, as are other **NR** parents, that people use children as an excuse to stay in their comfort zones. It’s an easy excuse not to do something adventurous. How to overcome the fear? Robin recommends two things:

1. Before embarking on a long international trip with your children for the first time, take a trial run for a few weeks.
2. For each stop, arrange a week of language classes that begin upon arrival and take advantage of transportation from the airport if available. The school staff will often handle apartment rentals for you, and you will be able to make friends and learn the area before setting off on your own.

But what if your concern isn’t so much losing your children but losing your mind because of your children?

Several families interviewed for this book recommended the oldest persuasive tool known to man: bribery. Each child is given some amount of virtual cash, 25–50 cents, for each hour of good behavior. The same amount is subtracted from their accounts for breaking the rules. All purchases for fun—whether souvenirs, ice cream, or otherwise—come out of their own individual accounts. No balance, no goodies. This often requires more self-control on the part of the parents than the children.

How to Get Airfare at 50–80% Off

This is not a book on budget travel. Most of the cost-cutting recommendations found in such guides are designed with the binge traveler in mind. For someone embarking on a mini-retirement, an extra $150 for hassle-free airfare amortized over two months is a better deal than 20 hours of manipulating frequent-flier points on an unknown airline or chasing questionable deals.

Following two weeks of research, I once bought a one-way standby ticket to Europe for $120. I arrived at JFK brimming with enthusiasm and confidence—look at all these schmucks paying retail!—and 90% of the “participating” airlines refused my ticket. Those that didn’t were booked for weeks solid. I ended up staying in a hotel for two nights for a $300 tab, filing a complaint with AMEX, and eventually calling 1–800-FLY-EUROPE from the JFK terminal in frustration. I bought a round-trip ticket to London on Virgin Atlantic for $300 and left an hour later. The same ticket cost more than $700 a week earlier.

After 25 countries, I’ve found a few simple strategies that get you 90% of the possible savings without wasting time or producing migraines.

1. Use credit cards with reward points for large muse-related advertising and manufacturing expenses.

I am not spending more money to get pennies on the dollar—these costs are inevitable, so I capitalize on them. This alone gets me a free round-trip international ticket each three months.

2. Purchase tickets far in advance (three months or more) or last minute, and aim for both departure and return between Tues day and Thursday.

   Long-term travel planning turns me off and can be expensive if plans change, so I opt for purchasing all tickets in the last four or five days prior to target departure. The value of empty seats is $0 as soon as the flight takes off, so true last-minute seats are cheap.

   Use Orbitz (www.orbitz.com) and www.kayak.com first. Fix the departure and return dates between Tuesday and Thursday. Then look at prices for alternative departure dates each of three days into the past and each of three days into the future. Using the cheapest departure date, do the same with the return dates to find the cheapest combination. Check this price against the fares on the website of the airline itself. Then begin bidding on www.priceline.com at 50% of the better of the two, working up in $50 increments until you get a better price or realize it's not possible.

3. Consider buying one ticket to an international hub and then an ongoing ticket with a cheap local airline.

   If going to Europe on a tight budget, you could get three tickets. One free Southwest ticket (from transferring AMEX points) from CA to JFK, the cheapest ticket to Heathrow in London, and then an übercheap ticket on either Ryanair or EasyJet to a final destination. I have paid as little as $10 to go from London to Berlin or London to Spain. That is not a typo. Local airlines will often offer seats on flights for just the cost of taxes and gasoline. To Central or South American destinations, I'll often look at local flights from Panama or international flights from Miami.

When More Is Less: Cutting the Clutter

> Human beings have the capacity to learn to want almost any conceivable material object. Given, then, the emergence of a modern industrial culture capable of producing almost anything, the time is ripe for opening the storehouse of infinite need! … It is the modern Pandora's box, and its plagues are loose upon the world.
>
> —JULES HENRY

> To be free, to be happy and fruitful, can only be attained through sacrifice of many common but overestimated things
>
> —ROBERT HENRI

I know the son of one deca-millionaire, a personal friend of Bill Gates, who now manages private investments and ranches. He has accumulated an assortment of beautiful homes over the last decade, each with full-time cooks, servants, cleaners, and support staff. How does he feel about having a home in each time zone? It's a pain in the ass! He feels like he's working for his staff, who spend more time in his homes than he does.

Extended travel is the perfect excuse to reverse the damage of years of consuming as much as you can afford. It's time to get rid of clutter disguised as necessities before you drag a five-piece Samsonite set around the world. That is hell on earth.

I'm not going to tell you to walk around in a robe and sandals scowling at people who have televisions. I hate that kashi-crunching holier-than-thou stuff. Turning you into a possession-less scribe is not my intention. Let's face it, though. There are tons of things in your home and life that you don't use, need, or even particularly want. They just came into your life as impulsive flotsam and jetsam and never found a good exit. Whether you're aware of it or not, this clutter creates indecision and distractions, consuming attention and making unfettered happiness a real chore. It is impossible to realize how distracting all the crap is—whether porcelain dolls, sports cars, or ragged T-shirts—until you get rid of it.

Prior to my 15-month trip, I was stressed about how to fit all of my belongings into a 14 **x** 10-foot rental storage space. Then I realized a few things: I would never reread the business magazines I'd saved, I wore the same five shirts and four pairs of pants 90% of the time, it was about time for new furniture, and I never used the outdoor grill or lawn furniture.

Even getting rid of things I *never* used proved to be like a capitalist short-circuit. It was hard to toss things I had once thought were valuable enough to spend money on. The first ten minutes of sorting through clothing was like choosing which child of mine should live or die. I hadn't exercised my throwing-out muscles in some time. It was a struggle to put nice Christmas clothing I'd never worn into the "go" pile and just as hard to separate myself from worn and ragged clothing I had for sentimental reasons. Once I'd passed through the first few tough decisions, though, the momentum had been built and it was a breeze. I donated all of the seldom-worn clothing to Goodwill. The furniture took less than 10 hours to offload using Craigslist, and though I was paid less than 50% of the retail prices for some and nothing for others, who cared? I'd used and abused them for five years and would get a new set when I landed back in the U.S. I gave the grill and lawn furniture to my friend, who lit up like a kid at Christmas. I had made his month. It felt wonderful and I had an extra $300 in pocket change to cover at least a few weeks of rent abroad.

I created 40% more space in my apartment and hadn't even grazed the surface. It wasn't the extra physical space that I felt most. It was the extra mental space. It was as if I had 20 mental applications running simultaneously before, and now I had just one or two. My thinking was clearer and I was much, much happier.

I asked every vagabond interviewee in this book what their one recommendation would be for first-time extended travelers. The answer was unanimous: Take less with you.

The overpacking impulse is hard to resist. The solution is to set what I call a "settling fund." Rather than pack for all contingencies, I bring the absolute minimum and allocate $100–300 for purchasing things after I arrive and as I travel. I no longer take toiletries or more than a week's worth of clothing. It's a blast. Finding shaving cream or a dress shirt overseas can produce an adventure in and of itself.

Pack as if you were coming back in one week. Here are the bare essentials, listed in order of importance:

1. *One week* of clothing appropriate to the season, including *one* semiformal shirt and pair of pants or skirt for customs. Think T-shirts, one pair of shorts, and a multipurpose pair of jeans.
2. Backup photocopies or scanned copies of all important documents: health insurance, passport/visa, credit cards, debit cards, etc.
3. Debit cards, credit cards, and $200 worth of small bills in local currency (traveler's checks are not accepted in most places and are a hassle)
4. Small cable bike lock for securing luggage while in transit or in hostels; a small padlock for lockers if needed
5. Electronic dictionaries for target languages (book versions are too slow to be of use in conversation) and small grammar guides or texts
6. One broad-strokes travel guide

That's it. To laptop or not to laptop? Unless you are a writer, I vote no. It's far too cumbersome and distracting. Using GoToMyPC to access your home computer from Internet cafés encourages the habit we want to develop: making the best use of time instead of killing it.

The Bora-Bora Dealmaker

BAFFIN ISLAND, NUNAVUT

Josh Steinitz[74] stood at the edge of the world and stared in amazement. He dug his boots into the six feet of sea ice and the unicorns danced.

Ten narwhals—rare cousins of the beluga—came to the surface and pointed their six-foot-plus spiral tusks toward the heavens. The pod of 3,000-pound whales then fell into the depths once again. The narwhals are deep divers—more than 3,000 feet in some cases—so Josh had at least 20 minutes until their reappearance.

It seemed appropriate that he was with the narwhals. Their name came from Old Norse and referred to their mottled white and blue skin.

Náhvalr—corpse man.

He smiled as he had done often in the last few years. Josh himself was a dead man walking.

One year after graduating from college, Josh found out that he had oral squamous carcinoma—cancer. He had plans to be a management consultant. He had plans to be lots of things. Suddenly none of it mattered. Less than half of those who suffered from this particular type of cancer survived.[75] The reaper didn't discriminate and came without warning.

It became clear that the biggest risk in life wasn't making mistakes but regret: missing out on things. He could never go back and recapture years spent doing something he disliked.

Two years later and cancer-free, Josh set off on an indefinite global walkabout, covering expenses as a freelance writer. He later became the cofounder of a website that provides customized itineraries to would-be vagabonds. His executive status didn't lessen his mobile addiction. He was as comfortable cutting deals from the over-water bungalows of Bora-Bora as he was in the log cabins of the Swiss Alps.

He once took a call from a client while at Camp Muir on Mt. Rainier. The client needed to confirm some sales numbers and asked Josh about all the wind in the background. Josh's answer: "I'm standing at 10,000 feet on a glacier and this afternoon the wind is whipping us down the mountain." The client said he'd let Josh get back to what he was doing.

Another client called Josh while he was leaving a Balinese temple and heard the gongs in the background. The client asked Josh if he was in church. Josh wasn't quite sure what to say. All that came out was, "Yes?"

Back among the narwhals, Josh had a few minutes before heading to base camp to avoid polar bears. Twenty-four-hour daylight meant that he had much to share with his friends back in the land of cubicles. He sat down on the ice and produced his satellite phone and laptop from a waterproof bag. He began his e-mail in the usual way:

"I know you're all sick of seeing me have so much fun, but guess where I am?"

► Q&A: QUESTIONS AND ACTIONS

> It is fatal to know too much at the outcome: boredom comes as quickly to the traveler who knows his route as to the novelist who is overcertain of his plot.
>
> —PAUL THEROUX, *To the Ends of the Earth*

If this is your first time considering a commitment to the mobile lifestyle and long-term adventuring, I envy you! Making the jump and entering the new worlds that await is like upgrading your role in life from passenger to pilot.

The bulk of this Q&A will focus on the precise steps that you should take—and the countdown timeline you can use—when preparing for your first mini-retirement. Most steps can be eliminated or condensed once you get one trip under your belt. Some of the steps are one-time events, after which subsequent mini-retirements will require a maximum of two to three weeks of preparation. It now takes me three afternoons.

Grab a pencil and paper—this will be fun.

1. **Take an asset and cash-flow snapshot**.

Set two sheets of paper on a table. Use one to record all assets and corresponding values, including bank accounts, retirement accounts, stocks, bonds, home, and so forth. On the second, draw a line down the middle and write down all incoming cash flow (salary, muse income, investment income, etc.) and outgoing expenses (mortgage, rent, car payments, etc.). What can you eliminate that is either seldom used or that creates stress or distraction without adding a lot of value?

2. **Fear-set a one-year mini-retirement in a dream location in Europe**.

Use the questions from chapter 3 to evaluate your worst-case-scenario fears and evaluate the real potential consequences. Except in rare cases, most will be avoidable and the rest will be reversible.

3. **Choose a location for your actual mini-retirement. Where to start?**

This is the big question. There are two options that I advocate:

1. Choose a starting point and then wander until you find your second home. This is what I did with a one-way ticket to London, vagabonding throughout Europe until I fell in love with Berlin, where I remained for three months.
2. Scout a region and then settle in your favorite spot. This is what I did with a tour of Central and South America, where I spent one to four weeks in each of several cities, after which I returned to my favorite—Buenos Aires—for six months.

It is possible to take a mini-retirement in your own country, but the transformative effect is hampered if you are surrounded by people who carry the same socially reinforced baggage.

I recommend choosing an overseas location that will seem foreign but that isn't dangerous. I box, race motorcycles, and do all sorts of macho things, but I draw the line at *favelas*,[76] civilians with machine guns, pedestrians with machetes, and social strife. Cheap is good, but bullet holes are bad. Check the U.S. Department of State for travel warnings before booking tickets (http:// travel.state.gov).

Here are just a few of my favorite starting points. Feel free to choose other locations. The most lifestyle for the dollar is underlined: Argentina (Buenos Aires, Córdoba), China (Shanghai, Hong Kong, Taipei), Japan (Tokyo, Osaka), England (London), Ireland (Galway), Thailand (Bangkok, Chiang Mai), Germany (Berlin, Munich), Norway (Oslo), Australia (Sydney), New Zealand (Queenstown), Italy places, it is possible to live well while spending little. I spend less in Tokyo than in California because I know it well. Hip, recently gentrified artist areas, not unlike the Brooklyn of 10 years ago, can be found in almost all cities. The one place I can't seem to find a decent lunch for less than $20 U.S.? London.

Here are a few exotic places I don't recommend for vagabonding virgins, though veterans can make them all work: all countries in Africa, the Middle East, or Central and South America (excepting Costa Rica and Argentina). Mexico City and Mexican border areas are also a bit too kidnap-happy to make it onto my favorites list.

4. **Prepare for your trip. Here's the countdown**.

► Three months out—Eliminate

Get used to minimalism before the departure. Here are the questions to ask and act upon, even if you never plan to leave:

What is the 20% of my belongings that I use 80% of the time? Eliminate the other 80% in clothing, magazines, books, and all else. Be ruthless—you can always repurchase things you can't live without.

Which belongings create stress in my life? This could relate to maintenance costs (money and energy), insurance, monthly expenses, time consumption, or simple distraction. Eliminate, eliminate, eliminate. If you sell even a few expensive items, it could finance a good portion of your mini-retirement. Don't rule out the car and home. It's always possible to purchase either upon your return, often losing no money in the process.

Check current health insurance coverage for extended overseas travel. Get the wheels in motion to rent, swap, or sell your home—renting out is most recommended by serial vagabonds—or end your apartment lease and move all belongings into storage.

In all cases where doubts crop up, ask yourself, "If I had a gun to my head and had to do it, how would I do it?" It's not as hard as you think.

► Two months out—Automate

After eliminating the excess, contact companies (including suppliers) that bill you regularly and set up autopayment with credit cards that have reward points. Telling them that you will be traveling the world for a year often persuades them to accept credit cards rather than chase you around the planet like Carmen Sandiego.

For the credit card companies themselves and others that refuse, arrange automatic debit from your checking account. Set up online banking and bill payment. Set up all companies that won't take credit cards or automatic debit as online payees. Set these scheduled checks for $15–20 more than expected when dealing with utilities and other variable expenses. This will cover miscellaneous fees, prevent time-consuming billing problems, and accrue as a credit. Cancel paper bank and credit card statement delivery. Get bank-issued *credit* cards for all checking accounts—generally one for business and one for personal—and set the cash advances to $0 to minimize abuse potential. Leave these cards at home, as they are just for emergency overdraft protection.

Give a trusted member of your family and/or your accountant power of attorney,[77] which gives that person authority to sign documents (tax filings and checks, for example) in your name. Nothing screws up foreign fun faster than having to sign original documents when faxes are unacceptable.

► **One month out—**

Speak to the manager of your local post office and have all mail forwarded to a friend, family member, or personal assistant,[78]who will be paid $100–200 per month to e-mail you brief descriptions of all nonjunk mail each Monday.

Get all required and recommended immunizations and vaccinations for your target region. Check the Centers for Disease Control and Prevention (www.cdc.gov/travel/). Note that proof of immunizations is sometimes required to pass through foreign customs.

Set up a trial account with GoToMyPC or similar remote-access software and take a dry run to ensure that there are no technological glitches.[79]

If resellers (or distributors) still send you checks—the fulfillment house should handle customer checks at this point—do one of three things: give the resellers direct bank deposit information (ideal), have the fulfillment house handle these checks (second choice), or have the resellers pay via PayPal or mail checks to one of the people you are trusting with power of attorney (far third). In the last case, give the person with power of attorney deposit slips so he or she can sign or stamp and mail in the checks. It is convenient to become a member of a large bank (Bank of America, Wells Fargo, Washington Mutual, Citibank, etc.) with branches near the person assisting you so that they can drop off the deposits while running other errands. No need to move all accounts to this bank if you don't want to; just open a single new account that is used solely for these deposits.

► **Two weeks out—**

Scan all identification, health insurance, and credit/debit cards into a computer from which you can print multiple copies, several to be left with family members and several to be taken with you in separate bags. E-mail the scanned file to yourself so that you can access it while abroad if you lose the paper copies.

If you are an entrepreneur, downgrade your cell phone to the cheapest plan and set up a voicemail greeting that states, "I am currently overseas on business. Please do not leave a voicemail, as I will not be checking it while gone. Please send me an e-mail at __@__.com if the matter is important. Thank you for your understanding." Then set up e-mail autoresponders that indicate responses could take up to seven days (or whatever you decide for frequency) due to international business travel.

If you are an employee, consider getting a quad-band or GSM-compatible cell phone so that the boss can contact you. Get a BlackBerry only if your boss will be checking to see if you are working via e-mail. Be sure to disable the dead giveaway "Sent from a BlackBerry" signature on outgoing e-mail! Other options include using a SkypeIn account that forwards to your foreign cell phone (my preference) or a Vonage IP box that allows you to receive landline calls anywhere in the world via a phone number that begins with your home area code.

Find an apartment for your ultimate mini-retirement destination or reserve a hostel or hotel at your starting point for three to four days. Reserving an apartment before you arrive is riskier and will be much more expensive than using the latter three to four days to find an apartment. I recommend hostels for the starting point if possible—not for cost considerations but because the staff and fellow travelers are more knowledgeable and helpful with relocations.

Get foreign medical evacuation insurance if needed for peace of mind. This tends to be redundant if useless if you are a 10-hour flight from civilization. I had evacuation insurance in Panama, as it's a 2-hour flight from Miami, but I didn't bother elsewhere. Don't freak out about this; it's just as true if you're in the middle of nowhere in the middle of the U.S.

► One week out—

Decide on a schedule for routine batched tasks such as e-mail, online banking, etc. to eliminate excuses for senseless pseudo-work procrasterbating. I suggest Monday mornings for checking e-mail and online banking. The first and third Mondays of the month can be used for checking credit cards and making other online payments such as affiliates. These promises to yourself will be the hardest to keep, so make a commitment now and expect serious withdrawal cravings.

Save important documents—including the scan of your identification, insurance, and credit/debit cards—to a small handheld storage device that plugs into a computer USB port.

Move all things out of your home or apartment into storage, pack a single small backpack and carry-on bag for the adventure, and move in briefly with a family member or friend.

► Two days out—

Put remaining automobiles into storage or a friend's garage. Put fuel stabilizer like Sta-Bil® in the gas tanks, disconnect the negative leads from batteries to prevent drain, and put the vehicles on jack stands to prevent tire and shock damage. Cancel all auto insurance except for theft coverage.

► Upon arrival (assuming you have not booked an apartment in advance)—

First morning and afternoon after check-in Take a hop-on-hop-off bus tour of the city followed by a bike tour of potential apartment neighborhoods.

First late afternoon or evening Purchase an unlocked[80]cell phone with a SIM card that can be recharged with simple prepaid cards. E-mail apartment owners or brokers on Craigslist.com and online versions of local newspapers for viewings over the next two days.

Second and third days Find and book an apartment for one month. Don't commit to more than one month until you've slept there. I once prepaid two months only to find that the busiest bus stop downtown was on the other side of my bedroom wall.

Move-in day Get settled and purchase local health insurance. Ask hostel owners and other locals what insurance they use. Resolve not to buy souvenirs or other take-home items until two weeks prior to departure.

One week later Eliminate all the extra crap you brought but won't use often. Either give it to someone who needs it more, mail it back to the U.S., or throw it out.

► TOOLS AND TRICKS

► **Virtual Tourist (www.virtualtourist.com)**

The single largest source of unbiased, user-generated travel content in the world. More than 1,000,000 members contribute tips and warnings for more than 25,000 locations. Each location is covered in 13 separate categories, including Things to Do, Local Customs, Shopping, and Tourist Traps. This is one-stop shopping for most mini-retirements.

► **Escape Artist (www.escapeartist.com)**

Interested in second passports, starting your own country, Swiss banking, and all the other things I wouldn't dare put in this book? This site is a fantastic resource. Drop me a note from the Caymans or jail, whichever comes first. Also search "How to Be Jason Bourne" at www.fourhourblog.com.

► **Outside Magazine Online Free Archives (http://outside.away.com)**

The entire archive of *Outside* magazine available online for free. From meditation camps to worldwide adrenaline hotspots, dream jobs to Patagonia winter highlights, there are hundreds of articles with beautiful photos to give you the walkabout itch.

► **GridSkipper: The Urban Travel Guide (www.gridskipper.com)**

For those who love *Blade Runner*-like settings and exploring the cool nooks and crannies of cities worldwide, this is the site. It is one of *Forbes's* Top 13 Travel sites and is "high-falootin' and low-brow all in the same breath" *(Frommer's)*. Translation: Much of the content is not G-rated. If four-letter words or a "world's sluttiest city" poll bother you, don't bother visiting this site (or Rio de Janeiro, for that matter). Otherwise, check out the hysterical writing and "$100 a day" info for cities worldwide.

► **Lonely Planet: The Thorn Tree (http://thorntree.lonelyplanet.com)**

Discussion forum for global travelers with threads separated by region.

► **Family Travel Forum (www.familytravelforum.com)**

A comprehensive forum on, you guessed it, family travel. Want to sell your kids for top dollar in the Eastern Bloc? Or save a few dollars and cremate Grannie in Thailand? Then this isn't the site. But if you have kids and are planning a big trip, this is the place.

► U.S. Department of State Country Profiles (www.state.gov/r/pa/ei/bgn/)

►World Travel Watch (www.worldtravelwatch.com)

Larry Habegger and James O'Reilly's weekly online report of global events and odd happenings relevant to travel safety, sorted by topic and geographic region. Concise and a must-see prior to finalizing plans.

► U.S. Department of State Worldwide Travel Warnings (http://travel.state.gov)

Mini-Retirement Planning and Preparation—Fundamentals

► Round-the-World FAQ (includes travel insurance) (www.perpetualtravel.com/rtw)

This FAQ is a lifesaver. Originally written by Marc Brosius, it has been added to by newsgroup participants for years and now covers nuts and bolts from financial planning to return culture shock and all in between. How long can you afford to be away? Do you need travel insurance? Leave of absence or resignation? This is an around-the-world almanac.

► Removing Clutter: 1–800-GOT-JUNK (www.1800gotjunk.com), Freecycle (www.freecycle.org), and Craigslist (www.craigslist.org)

I used Craigslist's "Free" category to get rid of four years of accumulated possessions in less than three hours on a Saturday evening. There were some for-sale items that I also cleared out at 30–40% of original retail. I then hauled off the last remaining items using the überfast 1–800-GOT-JUNK paid service. Freecycle is comparable to Craigslist for giving away, and getting, things for free when you're short on time. Get unattached and you'll make it a habit. I purge every 6–9 months, often including donations to Goodwill (www.goodwill.org), which can do pickups for free with advanced notice.

► One-Bag: The Art and Science of Packing Light (www.onebag.com)

One of *PC* magazine's "Top 100 [Can't Live Without] Sites." Pack light and experience lightness of being.

► U.S. Centers for Disease Control and Prevention (www.cdc.gov/travel)

Recommended vaccinations and health planning for every nation in the world. Certain countries require proof of inoculations to pass through customs. Get the shots well ahead of time, as some take weeks to order.

► **Tax Planning (www.irs.gov/publications/p54/index.html)**

More good news. Even if you permanently relocate to another country, you will have to pay U.S. taxes as long as you have a U.S. passport! Not to fret—there are some creative legal sidesteps, such as form 2555-EZ, which can provide up to an $85,700 income exemption if you spend at least 330 days of a consecutive 365 days off U.S. soil. This means you have 35 days in a given 12-month period to spend in the U.S. as you like, but no more. That's part of the reason my 2004 trip extended to 15 months. Get a good accountant and let them do the detail work to keep yourself out of trouble.

► **U.S.-Sponsored Overseas Schools (www.state.gov/m/a/os)**

If the idea of pulling your children out of school for a year or two isn't appealing, stick them in one of more than 190 elementary and secondary schools sponsored by the U.S. Department of State in 135 countries. Kids love home work.

► **Homeschooling 101 and Quickstart Guide (http://bit.ly/homeschooling101)**

This subsection of http://homeschooling.about.com/provides a step-by-step process for considering homeschooling options that can be applied to education during extended travel. Children can often return to traditional public or private schools ahead of their classmates.

►***Home Education* Magazine (www.homeedmag.com)** Rich collection of resources for homeschoolers, traveling families, and unschoolers. Links include curriculum, virtual support groups, legal resources, and archives. Good reasons to learn the law: Some U.S. states offer up to $1,600 of funding per year for qualified homeschooling expenditures, as it saves the state money to not educate your child in the public school system.

► **Universal Currency Converter (www.xe.com)**

Before you get caught up in the excitement and forget that five British pounds does not equal five U.S. dollars, use this to translate local costs into numbers you understand. Try not to have too many "Those coins are each worth four dollars?" moments.

► **Universal Plug Adapter (www.franzus.com)**

Carrying bulky cables and connectors is irritating—get a Travel Smart all-in-one adapter with surge protection. The size of a pack of cards folded in half, it is the only adapter that I've used everywhere without problems. Note that it is an adapter (helps you plug things in), but it is *not a transformer*. If the foreign wall outlet has twice as much voltage as in the U.S., your gadgets will self-destruct. Yet another reason to purchase necessities abroad instead of taking them all with you.

► **World Electric Guide** (www.kropla.com)

Figure out outlets, voltage, mobile phones, international dialing codes, and all sorts of things related to electric mismatching worldwide.

Cheap and Round-the-World Airfare

►**Orbitz** (www.orbitz.com), **Kayak** (www.kayak.com), and **Sidestep** (www.sidestep.com)

Search 400+ airlines worldwide for each service. Orbitz is my starting point for pricing comparisons, after which I check both Kayak and Sidestep. Sidestep has proven most effective when searching for flights that start and end outside of the U.S.

► **TravelZoo Top 20** (http://top20.travelzoo.com /)

Moscow for $129 one-way? These last-minute weekly travel specials might be the push you need to pull the trigger.

► **Priceline** (www.priceline.com)

Start bidding at 50% of the lowest Orbitz fare and move up in $50 increments.

► **CFares** (www.cfares.com)

Consolidator fares with free and low-cost memberships. I found a round-trip ticket from California to Japan for $500.

► **1–800-FLY-EUROPE** (www.1800flyeurope.com)

I used this to get the $300 roundtrip from JFK to London that left two hours later.

► **Discount Airlines for Flights within Europe** (www.ryanair.com , www.easyjet.com)

Free Worldwide Housing—Short Term

► **Global Freeloaders** (www.globalfreeloaders.com)

This online community brings people together to offer you free accommodation all over the world. Save money and make new friends while seeing the world from a local's perspective.

► **The Couchsurfing Project (www.couchsurfing.com)**
Similar to the above but tends to attract a younger, more party-hearty crowd.

► **Hospitality Club (www.hospitalityclub.org)**
Meet locals worldwide who can provide free tours or housing through this well-run network of more than 200,000 members in 200+ countries.

Free Worldwide Housing—Long Term

►**Home Exchange International (www.homeexchange.com)** This is a home exchange listing and search service with more than 12,000 listings in more than 85 countries. E-mail directly owners of potential homes, put your own home/apartment on the site, and have unlimited access to view listings for one year for a small membership fee.

Paid Housing—from Arrival to the Long Haul

► **Otalo (www.otalo.com)**
Otalo is a search engine for vacation rentals that searches across the Internet's many different vacation rentals sites and 200,000+ homes. Otalo is like a Kayak.com for vacation rentals. The site scours a variety of other rental search sites and aggregates the results in one easy-to-use search tool.

► **Hostels.com (www.hostels.com)**
This site isn't just for youth hostels. I found a nice hotel in downtown Tokyo for $20 per night and have used this site for similar housing in eight countries. Think location and reviews (see HotelChatter next) instead of amenities. Four-star hotels are for binge travelers; this site can offer a real local flavor before you find an apartment or other longer-term housing.

► **HotelChatter (www.hotelchatter.com)**
Get the real scoop on this daily web journal with detailed and honest reviews of housing worldwide. Updated several times daily, this site offers the stories of frustrated guests and those who have found hidden gems. Online booking is available.

► **Craigslist** (www.craigslist.org)

Besides local weekly magazines with housing listings, such as *Bild* or *Zitty* (no joke) in Berlin, I have found Craigslist to be the single best starting point for long-term overseas furnished apartments. As of this writing, there are more than 50 countries represented. That said, prices will be 30–70% less in the local magazines—if you have a tight budget, get a hostel employee or other local to help you make a few calls and strike a deal. Ask the local helper not to mention you're a foreigner until pricing is agreed upon.

► **Interhome International (www.interhome.com)**

Based in Zurich, more than 20,000 homes for rent in Europe.

► **Rentvillas.com (www.rentvillas.com)**

Provides unique renting experiences—from cottages and farmhouses to castles—throughout Europe, including France, Italy, Greece, Spain, and Portugal.

Computer Remote Access and Backup Tools

► **GoToMyPC (www.gotomypc.com)**

This software facilitates quick and easy remote access to your computer's files, programs, e-mail, and network. It can be used from any web browser or wireless device and works in real time. I have used GoToMyPC religiously for more than five years to access my U.S.-based computers from countries and islands worldwide. This gives me the freedom to leave all computers at home.

► **WebExPCNow (http://pcnow.webex.com)**

WebEx, the leader in corporate remote access, now offers software that does most of what GoToMyPC offers, including cut and paste between remote computers, local printing from remote computers, file transfers, and more.

►**DropBox (www.getdropbox.com)** and **SugarSync**

(www.sugarsync.com); then **JungleDisk (www.jungledisk.com)** and **Mozy (www.mozy.com)** Both DropBox and SugarSync perform backups and synching of files between multiple computers (home and travel computers, for example). JungleDisk and Mozy—I use the latter—have fewer features and are more specifically designed for automatic backups to their online storage.

Free and Low-Cost Internet (IP) Telephones

► **Skype (www.skype.com)**

Skype is my default for all phone calls. It allows you to call landlines and mobile phones across the globe for an average of 2–5 cents per minute, or connect with other Skype users worldwide for free. For about 40 euros per year, you can get a U.S. number with your home area code and receive calls that forward to a foreign cell phone. This makes your travel invisible. Lounge on the beach in Rio and answer calls to your "office" in California. Nice. Skype Chat, which comes with the service, is also perfect for sharing sensitive log-in and password information with others, as it's encrypted.

►**Vonage (www.vonage.com)** and **Ooma (www.ooma.com)**

Vonage offers a small adapter for a monthly fee that connects your broadband modem to a normal phone. Take it on your travels and set it up in your apartment to receive calls to a U.S. number. Ooma has no monthly fees and doesn't require a landline, but it offers similar hardware you can connect to broadband for a local U.S. number anywhere in the world.

►**VoIPBuster (www.voipbuster.com)** and **RebTel (www.rebtel.com)**

Both VoIPBuster and RebTel can provide "alias" numbers. Enter a friend's overseas number on their sites, and both will give you a local number in your area code that will forward to your friend. VoIPBuster also acts as a cheaper Skype with free calls to more than 20 countries.

International Multi-Band and GSM-Compatible Phones

► **My World Phone (www.myworldphone.com)**

I'm partial to Nokia phones. Ensure whichever phone you purchase is "unlocked"—that the SIM card can be swapped out in different countries with different providers.

► **World Electronics USA (www.worldelectronicsusa.com)**

Good explanation of which GSM frequencies and "bands" function in which countries, which will determine which phone you purchase for travel (and perhaps home).

Tools for Off-the-Beaten Path

► **Satellite Phones (www.satphonestore.com)**

If you will be in the mountains of Nepal or on a remote island and want the peace of mind (or headache) of having a phone nearby, these phones work via satellite instead of towers. Iridium has been